VOL. XIX APRIL, 1935 No. 2

THE JOURNAL OF APPLIED PSYCHOLOGY

JAMES P. PORTER, *Editor*
OHIO UNIVERSITY ATHENS, OHIO

With a Board of Cooperating Editors

SOME INTERESTING CONTRIBUTIONS IN THIS ISSUE:

E. G. WILLIAMSON, H. P. LONGSTAFF AND J. M. EDMUNDS. Counseling Arts College Students

JOHN N. WASHBURNE. A Test of Social Adjustment

HELEN A. WEBSTER AND MILES A. TINKER. The Influence of Paper Surface on the Perceptibility of Print

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PUBLISHED BI-MONTHLY BY THE EDITOR
OHIO UNIVERSITY, ATHENS, OHIO

PRINTED BY THE SCIENCE PRESS PRINTING COMPANY, LANCASTER, PA.

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The Journal of Applied Psychology

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The Journal of Applied Psychology is published bi-monthly. The subscription price is $6.00 a year. Single numbers $1.25 to $2.00, depending upon the number of pages. Remittances and business communications should be addressed to the Editor, James P. Porter, Ohio University, Athens, Ohio.

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COUNSELING ARTS COLLEGE STUDENTS

E. G. WILLIAMSON, H. P. LONGSTAFF, AND J. M. EDMUNDS
University of Minnesota

SINCE the first attempt to carry on a student counseling program at the University of Minnesota, beginning in September, 1923, the objective of the program has not changed materially, but the facilities for handling the students and their problems have increased and improved and the number of members of the faculty who handled the program has increased from three in 1923 to twenty in 1934. Before 1923 there had been other types of counseling programs but they had proved unsatisfactory. There had been the system in which some twenty students were automatically assigned to every faculty member who became responsible for them during their four years in college, a procedure which was wasteful of time and of little practical benefit. During these early years the counselors had handled the probation students in cooperation with the chairman of the Student Work Committee; but because it was found that the techniques of the counselors were not suited to so highly a specialized duty, beginning with 1923, the faculty counselors took over the type of work in which they are now engaged.

The aims of the counseling group as stated in 1928 by Donald G. Paterson are "first, to bring about a more harmonious adjustment of individual students to the opportunities available within and without the University, and second, to establish, as far as possible, a friendly and constructive personal relationship between individual members of the faculty and students desiring such contact."[1] Dean J. B. Johnston in the same publication outlined the work of the counselor. "The function of advisers is twofold: to help the student and to collect and report information which may be

[1] Problems of College Education. Edited by Earl Hudelson. University of Minnesota Press, 1928, pp. 265–6.

used by other agencies to improve the administration of the University. In helping the student the adviser is called upon to deal with curriculum matters, methods of study, living conditions, associations and habits, interests, extracurricular activities, health, and any and all matters which affect the student's work and the degree of his success as a student and a future citizen or professional man or woman."[2]

Ten years and more of practice have changed some of the procedures. Although it might be desirable to have a faculty counselor for each student, numbers of students, lack of enough members of the faculty who have a specialized interest or the skill to handle such cases, and the desire on the part of the administration to make the student's application for a counselor purely voluntary, have kept down the total number of students seeking aid. Under the present system, students come to the counselors in four ways. Some the counselor finds in his own classes; some are referred to the counselors by other members of the faculty; and others come because of advice of other students. But the largest group come as the result of another procedure. The Dean of the Arts college sends a letter to all freshmen and transfer students telling them of the work of the counselors and inviting them to make use of the agency. Many students, as a result, voluntarily seek a counselor, not always because they have any particular difficulty at the time, but in order that they may know some member of the faculty to whom they can go should difficulties arise. Formerly the applications for admission of entering students were read and, if any discrepancy indicating future trouble was found, the student was urged to see a counselor at once. The desire, however, to keep the whole program voluntary caused this procedure to be dropped.

The counselor, when he begins work with a student, has at his command a long list of aids. The student, before he comes to the counselor, has gone to the clerk of the committee to be assigned. She interviews the student, finds what his main problem seems to be, and if she thinks it necessary refers the

[2] *Id.*, p. 266.

student directly to the University Testing Bureau[3] for vocational testing, the results of which will help the student and counselor find a satisfactory solution for this type of problem. The clerk also calls the University Contact Desk,[4] a specialized agency for collecting all the information available on the campus about the student, his entrance test ratings and any other information which may be on his application blank or in the office of the registrar or that of the student health service. This information is sent to the counselor before the student arrives. If after consultation with the student the counselor thinks it necessary, he may send the student back to the Testing Bureau for additional tests, vocational interest tests, special aptitude tests, personality tests and others. The counselor also has available a list of men throughout the University, specialists in their own fields, to whom he may send the student if he thinks it necessary—a particularly useful resource with vocational problems. This list includes the psychiatrist, specialist in speech correction, instructors in the How to Study course and others.

No attempt to standardize the work of the counselor has ever been made. He may refer students he feels himself unable to handle to others better fitted, and he may use any method he thinks would be most successful in helping the student. Nor is he in any sense a disciplinary agent, and hence never attempts to decide arbitrarily what the solution to a student's problem shall be. He is a sort of Father Confessor without the Confessor's duty of imposing penance. He brings together as much information as he can, explains and interprets it for the benefit of the student. He may make suggestions and in special cases he can bring authority to bear if that be necessary; but his chief value lies in the information he can bring together with which the student may work himself out of his difficulty and in impressing on the student the fact that he, the counselor, is there to help at all times.

[3] Williamson, E. G. The University of Minnesota Testing Bureau, Personnel Journal. No. 6, April, 1934, pp. 345–355.

[4] Williamson, E. G., and Paterson, D. G. Coordinating Counselling Procedures, Journal Higher Education. No. 2, Feb., 1934, pp. 75–78.

One more point must be kept in mind when we consider the past and future work of the counselors. Many problems presented by the students can not be settled in one interview, even in the interviews of a single quarter or in some cases in those of a year. Some carry over to a second and even a third year. Then, too, with one individual the solution of a problem may be simple but with another student the same type of problem may be involved and require a much longer time and consultation with many other counselors for the discovery of a satisfactory solution.

In order to provide data for an accurate description of the present program of counseling, a survey of the work in 1933–34 was made. In this survey data were collected about the types of students being handled by counselors; the extent of case work involved, such as the number of interviews, the amount of data collected by the counselor in his case work, the number and kind of other agencies and individuals in the personnel program on the campus used by the counselor in handling his cases, the types of problems dealt with, what is done with these problems by the counselors; and the relationship, if any, obtaining between type of problem and the amount of case work. With these objectives in mind at the end of the academic year each counselor dictated an analysis of his own case records following the outline of a uniform questionnaire.

A total of 371 cases are involved in this analysis, including those that were assigned by the clerk of the counselors' committee and those who came directly to the counselor and were subsequently registered with the clerk. All of those cases made their first contact with the counselor during the academic year of 1933–34. These 371 cases constitute 68 per cent of the total 544 cases handled by the faculty counselor's committee during the fall and winter quarters of 1933–34.

A total of 371 cases are distributed by sex and class as follows: 287 freshmen, 122 of whom were men and 165 women; 69 sophomores, 31 men and 38 women; 12 juniors, 5 men and 7 women; and 3 seniors, 1 man and 2 women—a total of 159

ERRATA

We regret very much to report that in some inexplicable manner a serious error occurred in the printing of Table 4, page 17, of the article by Dr. H. C. Lehman in the February issue of this Journal. Subscribers will therefore insert this corrected table in the place of the original.

TABLE IV*

Mean Point-Hour-Ratios Earned During Their First Two Semesters at Ohio University by Certain Fraternity Freshmen and Control Groups of Non-Fraternity Freshmen Equated on the Basis of:

(1) Sex,
(2) Year of Matriculation, and
(3) Percentile Rating on the Ohio State University Psychological Examination.

SEM.	NO. OF CASES	MEAN PT-HR-RATIO	DIFF.	P.E. OF DIFF.	DIFFERENCE / P.E. OF DIFF.	CHANCES IN 100	ODDS
I (Fall)	261 Fraternity Men	1.480					
II (Spring)	261 Fraternity Men	1.262	−.218	.0232	9.3898	99.999999	More than 1,000,000 to 1
I (Fall)	261 Non-Fraternity Men	1.114					
II (Spring)	261 Non-Fraternity Men	1.246	+.132	.0498	2.649	96.30	26.0 to 1
I (Fall)	110 Sorority Women	1.642					
II (Spring)	110 Sorority Women	1.547	−.095	.0454	2.093	92.07	11.6 to 1
I (Fall)	110 Non-Sorority Women	1.254					
II (Spring)	110 Non-Sorority Women	1.331	+.077	.0568	1.355	81.96	4.5 to 1

* In this table the boys' data are combined for the five-year interval 1928–29 to 1932–33 inclusive; the girls' data are combined for the three-year interval 1930–31 to 1932–33 inclusive.

men and 212 women. Two hundred forty-six were assigned through the clerk of the committee; 105 were volunteers who came directly to the counselor; 18 were referred by faculty members directly to the counselor; and 2 were referred directly to the counselor by other students. There were no essential differences with regard to origin of contact among the various classes, nor between men and women.

The greatest number of new contacts, as might be expected, was made in the fall quarter. Two hundred forty-nine cases were interviewed for the first time during the fall quarter, 21 in September, 81 in October, 99 in November and 48 in December. One hundred nine cases originated during the winter quarter, 36 in January, 39 in February, and 34 in March. Thirteen cases originated in April and May. Although these figures do not include the case load for the entire academic year, they are in agreement with those of previous years, the largest number of new cases for any one month being reported for November.

Because some cases are much more complicated than those which can be settled in one or two interviews, the number of interviews per student varies greatly. Approximately 1031 interviews were held with these 371 cases. One hundred sixty-five of these cases were seen only once; 123 were seen 2 or 3 times; 40 were seen 4 or 5 times; 13 were seen 6 or 7 times; 4 were seen 8 or 9 times; and 26 were seen 10 or more times. The average for the 371 cases was 2.78 per student.

Because many educators assume that students of high ability solve their problems unaided, the 371 cases were classified according to college aptitude rating,[5] high school scholarship percentile rank, and college aptitude percentile rank. See Table I. Most of the students are above the fortieth or fiftieth percentile on all these ratings. This may result from the fact that the larger percentage of students with low ratings are not

[5] Johnston, J. B. Who should go to College. University of Minnesota Press. 1930. Pp. 19. The college aptitude rating is the arithmetic average of two percentiles, average high school grade for three and one-half years and the college aptitude test.

registered in this college. It may also result from the fact that the probation advisers are given supervision over the work of these students, thus making it unnecessary for them to seek the aid of counselors.

TABLE I

*Distribution of Percentile Ranks of Counseled Students**

PERCENTILE RANK	COLLEGE APTITUDE RATING	HIGH SCHOOL SCHOLARSHIP	COLLEGE APTITUDE TEST
91–100	29	90	50
81–90	42	40	36
71–80	56	56	51
61–70	47	30	37
51–60	45	24	43
41–50	45	24	32
31–40	28	20	43
21–30	9	10	27
11–20	3	8	37
1–10	2	4	15
Total	306	306	371
Mean	64.20	71.55	56.67
Standard Deviation	± 20.15	± 23.81	± 27.36

* All freshmen in the University take the college aptitude test, but high school scholarship rank is not available for all students.

The classification of the College Aptitude Ratings (C. A. R.) of these 371 cases revealed only minor differences, according to sex and class, there being only a few more men than women below the twenty-first percentile. There were 3 junior men whose C. A. R.'s were 39, 37, and 33, and 5 junior women with ratings of 39, 53, 72, 84, and 53. There was only one senior man whose C. A. R. was 90, and two senior women with C. A. R.'s of 61 and 89. On the whole, these 371 cases are students with fairly good general college aptitude.

With regard to the collection of data supplementary to what the counselor may elicit through his own interviewing of the student, he made use of the following sources to the extent indicated by the frequency numbers: reports from the Health Service regarding physical defects and health, 323;

Faculty-Student Contact Desk for University entrance test ratings, 295; abstracts of student's application for admission blank, 261; vocational test profile and case report from University Testing Bureau, 167; Registrar's office for grades, 44; departmental major advisers in various colleges, 19; other faculty counselors, 9; parents, 6; persons outside of the University, 6; Speech Clinic, 4; special probation advisers, 3; Employment Bureau, 2; deans of the various colleges, 2; Dean of Men and Dean of Women, 1; high school counselor, 1; psychiatrist, 1; Y. M. C. A. or Y. W. C. A. secretaries, 1. In all, a total of 1145 uses were made of these resources for information about the students. Most of these data were secured through the Contact Desk in response to the request of the Committee's clerk made at the time students were assigned to a counselor. The amount of case material indicates a satisfactory state of counselling and case work in that the faculty counselors had available a large amount of information to supplement that which they derived from the interview itself.

Quite frequently it is necessary to refer a student to a specialized personnel agency for a technical type of adjustment or service which the faculty counselor is not qualified to perform. On the other hand, with such extensive data available as is indicated in the preceding paragraph, some of the solutions to problems are so self-evident that the counselor can be of service to the student without referring him to others. One would not expect, therefore, to find many students being referred after noting the extensive body of information that the counselor has with regard to each student. As a matter of fact for 186 or 43.5 per cent of the problems, there were no other personnel agencies or individuals used by the counselors in aiding the student to solve his problem. For the solution of 109 problems, chiefly those concerning registration and selection of subjects, faculty and departmental major advisers were used as a resource. In 42 cases the students were referred by counselors to the University Testing Bureau for specialized vocational guidance. In addition to these 42,

many other cases came directly to the Testing Bureau, were later referred to the faculty counselors and, therefore, appear under the preceding analysis of agencies used in collection of data. Deans of the colleges were used for 13 cases; other faculty counselors for 13; the University Committee on Federal Undergraduate Scholarships for 12; persons outside the University for 7; parents for 6; college scholarship probation advisers for 5; psychiatrist for 5; Dean of Men or Dean of Women, 5; Speech Clinic, 4; miscellaneous agencies such as churches, 4; Y. M. C. A. or Y. W. C. A., 3; Health Service, 3; Employment Bureau, 3; How to Study instructor, 2; Registrar, 2; W. S. G. A. Tutor Bureau, 2; Woman's Occupational Bureau, 1. In all, these 371 cases were referred to other agencies a total of 427 times, many students being referred to more than one agency.

The histories of these 371 cases were analyzed to determine the types of problems exhibited by these students. Some students exhibited more than one type. These problems were classified as follows:

TABLE II

Types of Problems	*Frequency of Occurrence*
1. *Financial:* need or desire for part-time work, scholarships or loans	114
2. *Vocational:* choice of an occupation; aptitude for and information about occupations	324
3. *Educational:* selection of courses and sequences of subjects in line with occupational choice; registration procedure; study methods; low aptitude for college work; specific disabilities in reading, etc.; understanding grading standards, student responsibility for college work, etc.	411
4. *Social, personal, and emotional:* too frequent or inadequate participation in extra-curricular activities; desire for friendly relationship with faculty; need for encouragement and self-confidence; social timidity; conflicts with family; other worries or emotional problems	347
5. *Health and Physical Disabilities:* illness, fatigue or disabilities	117
Total	1313

Additional analyses of the types of problems were made to discover answers to the following questions:

1. Are there any differences in the types of problems confronting students of various levels of ability?
2. Are there clusters of types of problems?
3. What is the nature of the advice given in helping students solve their problems?

In studying the relationship between types of problems and levels of academic aptitude, college aptitude rating alone was used. The results for high school rank and college aptitude test were similar. The average number of problems decreases from the lower to the higher levels. But the small number of cases at the lower levels may not be representative.

TABLE III

Relationship between College Aptitude Rating and Number of Problems at Different Levels

C.A.R.	NUMBER OF STUDENTS	NUMBER OF PROBLEMS	AVE. NO. PROBLEMS PER STUDENT
91–100	29	51	1.75
81– 90	42	74	1.76
71– 80	56	99	1.76
61– 70	47	96	2.04
51– 60	45	112	2.48
41– 50	45	101	2.24
31– 40	28	64	2.28
21– 30	9	26	2.88
11– 20	3	11	3.66
1– 10	2	3	1.50
	306	637	2.08

Still another question to be answered by an analysis of these data is: are there clusters of problems? That is, do students who have vocational problems also have financial, educational, social, or health problems? In making this study, each problem checked by a counselor as being present in the student's case was tabulated against other problems possessed by that same student and a combined scattergraph

made of these tabulations for all students. Since many students possess many problems the number of tabulations, of course, will be greater than the total number of students. To show definite trends, the problems were grouped according to the five general types previously described. The results are summarized as follows.

There were 114 financial problems indicated in the case histories of these 371 students. These financial problems were associated with other types of problems as follows:

TABLE IV

Type of Problem Associated with Financial	*Number*	*Per Cent*
No other problem present	4	3.51
Vocational problems	30	26.32
Educational	31	27.19
Social, emotional, and personal problems	38	33.33
Health Problem	11	9.65
Total	114	100.00

In other words, students who had financial problems tended to have vocational, educational, social, and health problems to the extent of the percentages represented above. For the most part, financial problems were associated with vocational, educational, social, emotional, or personal problems in one-third or fewer of the cases.

There were 324 vocational problems. Fifty-two, or 16 per cent, were not associated with any other type of problems. Thirty, or 9.3 per cent were associated with financial; 146, or 45.1 per cent were associated with educational; 84, or 25.9 per cent were associated with social, emotional, or personal problems; and 12 or 3.7 per cent were associated with health problems. It is apparent that 45 per cent of the vocational problems were also associated with educational problems and 25 per cent were associated with social, personal, or emotional problems. In other words, vocational problems tend to be associated to a great extent with other problems of the educational and social type.

Of the 411 educational problems, 55 or 13.4 per cent were not associated with any other type; 31 or 7.6 per cent were associated with financial; 146 or 35.5 per cent were associated with vocational; 153 or 37.2 per cent were associated with social, personal or emotional; 26 or 6.3 per cent were associated with health. For the greater part, educational problems, therefore, are associated with vocational, or social, personal and emotional problems and not with financial and health problems.

Of the 347 social, personal, and emotional problems, 5 or 1.4 per cent were independent, that is, not associated with other types; 38 or 11.0 per cent were associated with financial; 84 or 24.2 per cent were associated with vocational; and 153 or 44.1 per cent were associated with educational; and 67 or 19.3 were associated with health. A little less than half of these social, personal, and emotional problems were associated with educational and about one-fourth were associated with vocational. Nineteen per cent of the students with this type of problem also had health problems.

Of the 117 health and physical defect problems, only 1 or .9 per cent appeared independently of other problems. Eleven or 9.4 per cent were associated with financial; 12 or 10.2 per cent were associated with vocational; and 26 or 22.2 per cent were associated with educational; and 67 or 57.3 per cent were associated with social problems. Here again, by far the greater per cent of health or physical defect problems were associated with social, emotional, and personal problems and only about 22 per cent were associated with educational problems.

These results show the extent to which student problems tend to be associated with each other in the same case history. There is a tendency, present in about half of the cases, for certain types of problems to be associated in the same student case histories. For the most part, vocational, educational, social, and health problems are associated. This association, however, is not so marked as to lead one to expect this association in all cases. Neither does this association indicate any

TABLE V

Classification of what Counselors do for Various Types of Student

Types of Problems	*Frequency of Occurrence*	*Per Cent of Total*
Financial Problems		
1. Discussion of relation of part-time work to class schedule	5	.58
2. Discussion of need for work	2	.23
3. Suggestion of ways of getting jobs	1	.12
4. Discussion of student's expenses and financial resources	31	3.58
5. Discussion of scholarships and loan funds	4	.46
6. Letters of recommendation for jobs, scholarships, and loans	14	1.62
Vocational Problems		
1. Description of occupations	95	10.97
2. Referral for vocational information	56	6.46
3. Referral for diagnosis of aptitude	43	4.97
4. Discussion of aptitudes	88	10.16
5. Discussion of student's financial resources for occupational training	2	.23
Educational Problems		
1. Use of class schedule bulletins for program making	190	21.94
2. Referral for information about course prerequisites, sequences, majors, etc.	26	3.00
3. Cultivation of interest in studies, scholastic record, etc.	20	2.31
4. Explanation of recitation method of study	1	.13
5. Discussion of physical surroundings conducive to effective study	4	.46
6. Discussion of methods of vocabulary building	3	.35
7. Tutorial aid with a specific subject	5	.58
8. Aid in selecting schedule of classes in line with aptitude, interests, special disabilities, etc.	3	.35
9. Referral for additional aid with study problems	2	.23
10. Aid in planning schedule of hours for study	17	1.96
11. Attempt to analyze cause for difficulty with a specific subject	10	1.15
12. Explanation of student's low aptitude as cause of low scholarship	21	2.42
13. Recommendation of a non-college type of vocational training	1	.13
14. Attempt to diagnose and overcome special disability in spelling, grammar, mathematics, etc.	4	.46
15. Discussion of college grading standards, etc.	11	1.27

TABLE V—(*Continued*)

Types of Problems	*Frequency of Occurrence*	*Per Cent of Total*
Social, Personal and Emotional		
1. Warning of over-emphasis upon social activities	8	.92
2. Arranging participation in activities, such as band, debate, etc.	19	2.19
3. Establishing friendly contacts with faculty for future use	20	2.31
4. Continued friendly contacts with student	9	1.04
5. General discussion, encouragement and assistance with self confidence	33	3.81
6. Suggestions for specific personality difficulties	45	5.19
7. Discussion of methods of meeting people and making friends	10	1.15
8. Suggestion of discussion between family or friends over mutual conflicts	5	.58
9. Discussion of worries and other emotional problems	23	2.65
10. Referral for technical assistance	8	.92
Health and Physical Disabilities		
1. Discussion of handicaps in relation to vocations	12	1.38
2. Referral for specific medical treatment	5	.58
3. Referral for orthopedic gymnasium work	2	.23
4. Discussion of living arrangement, sleep, diet, etc.	7	.81
5. Athletics suggested for better health habits	1	.12
Total	866	100.00

explanation as to the causal relationship among these various types of problems.

Most of the published papers dealing with personnel work have reported the result of research on instruments for measuring aptitudes, achievement, and interest. The clinical phases of counseling have been ignored or dealt with in a cursory manner. It is perhaps fair to conclude that too little attention has been given to the development of procedures and techniques.

Earlier sections of this paper have dealt with those counseling procedures involving the counselor's use of personnel agencies. A final analysis of case histories was made to dis-

cover what the counselors did to integrate all case information into a program of action for the students. The results are summarized in Table V by frequency of occurrence of suggestions or advice classified by types of problems. The variety of advice indicates that the counselors based their procedures upon the unique features of each case and avoided blanket prescriptions.

The data in Table V should prove helpful to those interested in developing a program of counseling. Considered in connection with previous sections of this paper, these data illustrate how personnel work may be coordinated by bringing to bear on each student all the resources of the University.

The question is often asked, does this counseling work actually help students? Thus far, no satisfactory experimental evidence is available for an affirmative answer to this question. But the extensive case histories, the variety of objective data used, the coordination of personnel agencies, and the variety of procedures and advice constitute empirical evidence of the validity of counseling.

A TEST OF SOCIAL ADJUSTMENT

JOHN N. WASHBURNE
Syracuse University

In an attempt to construct and validate a test surveying and summating behavior factors which are not measured by intelligence tests but which are important in social adjustment, the following procedures were employed, and the following results obtained:

I. A questionnaire (called the OSPA Inventory) was designed to get at five characteristics which appear from common observation to vary with social adjustment independently of intelligence.

The five characteristics were named and defined:

1. *Purpose,* that is, desire definitely directed toward a goal involving plan, evaluation, selection, and effort.

2. *Socialness,* that is, a broad and lively interest in people.

3. *Sympathy,* that is, sensitive, empathetic, and non-negative responsiveness to people.

4. *Poise,* that is, emotional stability in social situations, and the general sense of psychological intimacy and security with people.

5. *Impulse-judgment,* (5) that is, self-control in the sense of being able to sacrifice an immediate or easily attained satisfaction for a more remote or more difficult satisfaction which is recognized as greater.

These five classes of behavior were selected not only because of their inclusiveness, but also because they appear to be capable of offsetting one another, and should therefore be considered in conjunction with one another, and scored in such a way that a high score in one may compensate for a low score in another. For it is fairly evident that an individual may be somewhat negative in the sense that we have indicated and yet be fairly well adjusted socially because of his stability and self-control or because of a controlling purpose. On the other

hand, a self-indulgent and shiftless individual may be found to be fairly well adjusted socially because of his friendliness, sympathy, and poise. And so on, with other combinations of these characteristic behavior patterns.

II. Intentional and unintentional inaccuracies in the answering of the questionnaire were guarded against:

1. By trying out the individual questions in a large number of personal interviews and clarifying or eliminating them as a result of observed misinterpretations.

2. By including in the total test score a score for *objectivity*, defined as the ability and willingness (under the conditions of the test), to recognize and report accurately one's own conduct and feelings. Questions designed to test objectivity were interspersed with the other questions of the questionnaire.

III. *The coefficient of reliability of the total OSPA Test score was found to be .92 ± .01.*

This correlation was obtained, as indicated in the footnote to Table I, by retesting a population of college students after an interval of one semester.

IV. *The coefficient of validity for the total OSPA Test score was found to be .90,* (that being the bi-serial *r* for prisoners and well adjusted adolescents).

Validity was determined by dividing each of four populations (described in Table II) into two groups, contrasted for social adjustment, and matched for other factors:

A. In population A, a group of exceptionally well adjusted adolescent school children were compared with a group of exceptionally maladjusted adolescent school children of the same age, sex, and intelligence.

B. In population B, public school children whose average deportment grades were "good" or "excellent" were compared with those whose averages were "fair" or "poor."

C. In population C, children from the Syracuse State School for the Feeble Minded (I.Q.'s between 60 and 80) who, over a period of five or more years, had been consistently reported as "well adjusted" by doctors, teachers, matrons, etc., were compared with those who had been consistently reported as maladjusted.

TABLE I

Correlations from Population A

	M. A.	C. A.	OBJ.	SYMP.	POISE	WISH	TOTAL OSPA.
I. Q.	.98 ± .002[1]	.00 ± .07	.34 ± .06	.01 ± .09	−.01 ± .07	.06 ± .07	.17 ± .06
C. A.	.06 ± .07		.07 ± .09	−.39 ± .06	.38 ± .06	.03 ± .07	.03 ± .07
OBJ.			.73 ± .03[2]	.08 ± .07	−.20 ± .06	.01 ± .07	.06 ± .06[3]
SYMP.				.79 ± .03[2]	.12 ± .07	.43 ± .05	.43 ± .04[3]
POISE					.81 ± .02[2]	.21 ± .06	.32 ± .05[3]
WISH						.88 ± .02[4]	.51 ± .03[3]
TOTAL OSPA							.92 ± .01[5]

[1] Since the great majority of children in this population were over 14.5 years of age, and since this was the assumed adult mental age used in deriving mental ages from chronological ages and I. Q. s, the M. A. s in this population are almost wholly functions of the I. Q. s.

[2] Self correlation obtained from population of college students retested after one semester.

[3] Spurious correlation has been deducted. In Musselman's formula ([3]) t/s = spurious r of a single test with a composite of which it is a part (t, being number of elements in a single test and s being number of elements in the composite), S was counted as 165 although it would be possible to earn 175 theoretically. Actually the maximum score in all elements except the wish element was frequently approached. Therefore, the obtained spurious r may be regarded as a little too low for all elements except the wish element, and for this it is a little too high.

[4] Obtained from college students retested after one month.

[5] Obtained by applying Brown's prophesy formula to a reliability of .90 ± .01 yielded by the sum of test elements exclusive of wishes. The N in the formula was counted as 1.2. However, by another population of college students the reliability of the whole OSPA score was the same (namely, .90 ± .02) as for the sum of the OSP elements alone.

D. In population D, high school boys and girls of average social adjustment were compared with prisoners of the same sex and approximately the same age and intelligence.

In the principal experimental population, A, there were included as many tests (namely, 148) as could be found in a total of 1542, that were complete in themselves and in the information (IQ, grade, age, etc.) that went with them, and that could be matched, test for test, for IQ, sex, and age, and contrasted for conduct. The procedure, briefly, was as follows:

When a class of children was tested, the teacher was asked to point out those who seemed to be most noticeably maladjusted, this term being understood to refer chiefly to trouble makers and non-cooperators, but also to cases of queerness, nervousness, and dissatisfaction.

When the testing program in a school was finished, the examiner went through all the papers with the principal and one or two other persons—psychologist, dean, or assistant principal. Only when all of these people (the classroom teacher and at least two others) agreed on the outstanding adjustment or maladjustment of a student was his paper put in the well-adjusted or maladjusted group. Thus, when 1542 children had been tested, there were three groups of papers: two relatively small groups of well adjusted and maladjusted pupils, and one large group of pupils who were neither markedly well adjusted nor maladjusted.

The well adjusted and maladjusted groups were divided into sex subgroups, and the papers of maladjusted boys were then matched for age and IQ, individual for individual, with the papers of well adjusted boys, and maladjusted girls were matched with well adjusted girls.

In a few instances when no paper in one extreme group could be found to match a paper in the other extreme group, one was taken from the middle group to make up the deficiency, the assumption being that these children were inferior to the exceptionally well adjusted and superior to the exceptionally maladjusted. But this procedure led, of course, to a somewhat greater overlapping of the contrasted groups.

TABLE II

I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Population Tested	Members	Total Number Tested	Method of Matching	Number Matched	Method of Determining Intelligence	Method of Determining Social Adjustment	Composition Members
A	Public School Children 13–17 years of age	1542	Individual papers matched for IQ, age, and sex; contrasted for conduct as judged by teachers, etc.	148	Principally the Otis Self Administering Intelligence Tests. A few Multi-Mental and Stanford-Binet.	METHOD OF EXTREMES. Agreement of several judges on cases of outstanding social adjustment or maladjustment.	1. 37 P. S. boys and P. S. girls upon whose exceptional good adjustment teachers, principals etc., agree. 2. 37 P. S. boys and P. S. girls upon whose exceptional poor adjustment teachers, principals etc., agree.
B	Public School Children 9–19 years of age	179	Contrasted for conduct as rated on report cards	179	Same as Population A	METHOD OF AVERAGE RATING. Average deportment grades for one or more years.	1. P. S. boys and girls whose average deportment grades are "good" or "excellent." 2. P. S. boys and girls whose average deportment grades are "fair" or "poor"
C	Children from the Syracuse State School for Feeble-minded. 14–20 years of age IQ 60–90	40	Matched for age contrasted for conduct.	40	Stanford Revision of the Binet-Simon Intelligence Test.	METHOD OF AVERAGE RATING. Conduct described at regular intervals by doctors, psychologists, teachers, and attendants over a period of years; types of conduct appearing in record, scored and averaged by experimenter.	1. Feeble-minded boys and girls who have lived in the same institution for from one to seven years have made a consistently favorable adjustment. 2. Feeble-minded boys and girls who have lived in the same institution for from one to seven years and have made a consistently unfavorable adjustment.
D	Male and female students and prisoners.	976 H. S. Students 377 Prisoners	Matched for age and roughly for IQ.	100	Intelligence of students same as Population A. Intelligence of female prisoners measured by Otis Self Administering Test. Intelligence of male prisoners measured by an abbreviation of the Stanford-Binet.	METHOD OF EXTREMES. Social adjustment determined by whether individual of below average intelligence is in H. S. or in the reformatory.	1. 25 Males and 25 male H. S. Students 2. 25 Male and 25 male prisoners.

VII.	VIII.	IX.	X.	XI.
Method of Determining Social Adjustment	Composition of Contrasted Groups			
	Members	Number in Each Group	Average I.Q.	Average Age In Years
METHOD OF EXTREMES. Agreement of several judges on cases of outstanding social adjustment or maladjustment.	1. 37 P. S. boys and 37 P. S. girls upon whose exceptionally good adjustment teachers, principals, etc., agree.	74	100.10	15.68
	2. 37 P. S. boys and 37 P. S. girls upon whose exceptionally poor adjustment teachers, principals, etc., agree.	74	100.11	15.35
METHOD OF AVERAGE RATING. Average deportment grades for one or more years.	1. P. S. boys and girls whose average deportment grades are "good" or "excellent."	129	104.80	12.85
	2. P. S. boys and girls whose average deportment grades are "fair" or "poor."	50	101.58	14.15
METHOD OF AVERAGE RATING. Conduct described at regular intervals by doctors, psychologists, teachers, and attendants over a period of years; types of conduct appearing in record, scored and averaged by experimenter.	1. Feeble-minded boys and girls who have lived in the same institution for from one to seven years, have made a consistently favorable adjustment.	16	79.0	15.33
	2. Feeble-minded boys and girls who have lived in the same institution for from one to seven years, and have made a consistently unfavorable adjustment.	24	64.0	15.57
METHOD OF EXTREMES. Social adjustment determined by whether individual of below average intelligence is in H. S. or in the reformatory.	1. 25 Males and 25 female H. S. Students.	50	94.78	18.10
	2. 25 Male and 25 female prisoners.	50	91.66	17.94

The difference in the IQ of individuals was in no case more than five points, and the difference in chronological age was in no case more than four months.

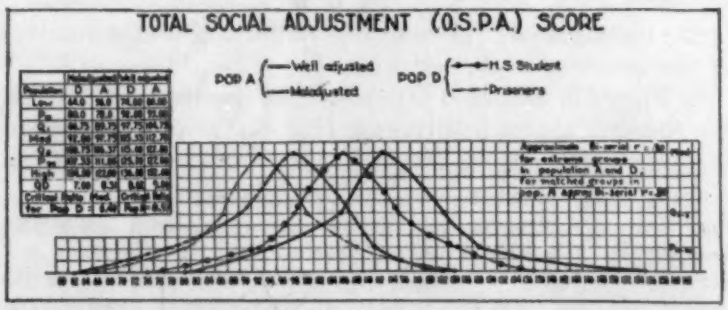
The averages of the IQ's and of the chronological ages in the two groups are shown in Table II. The range in mental ages was from 10.0 to 18.4, and in IQ from 60.0 to 127.0.

The tests were graded according to a scoring scheme based on results in a preliminary sampling of populations B and C. This scheme weighted answers which occurred with distinctly different frequencies among the well adjusted and the maladjusted.

V. *The results in all populations were in agreement in respect to total OSPA score, and the elements Poise, Purpose, Socialness, Objectivity and Impulse-Judgment.* In the case of Sympathy, institutional conditions apparently changed the relative standing of adjusted and maladjusted groups.

When four groups were arranged (as in Figure 1) *in order of degree of social adjustment* (1. *exceptionally well adjusted adolescents,* 2. *adolescents of average adjustment,* 3. *maladjusted high school children,* 4. *adolescent prisoners*), *the results showed that group 1 scored highest in the OSPA Test, group 2 scored second, group 3 third, and group 4 lowest. Furthermore, a similar correspondence was found in wish score* (*Socialness and Purpose*), *in Poise, and in Impulse-Judgment.*

FIG. I.



The most striking feature of Figure 1 is the similarity of results in populations A and D. The two curves in population

A overlap in almost exactly the same manner as do the two curves in population D. Moreover, the relative position of all four curves to each other is in nice accordance with the results one would expect a true measure to yield providing our other criteria of social adjustment were substantially correct.

Thus according to our outside criteria the group represented by the solid line was judged most favorably as being exceptionally well adjusted, the group represented by the line with circles was judged neither favorably nor unfavorably, the group represented by the line of dashes was judged unfavorably, but, for the most part, not as being delinquent or incorrigible, and the group represented by the line of dots and dashes was judged most unfavorably as being made up wholly of incorrigibles, delinquents, and wayward minors. According to these judgments, then, the lines should be arranged in descending order as follows: 1. solid, 2. line and circles, 3. dash, 4. dot and dash. And this is precisely the order yielded by our test.

VI. The validity of the subdivisions of the test ("Test elements") and of the individual questions is indicated in Figures 2, 3, and 4.

In Figure 2 bars extending upward represent questions which were answered correctly (*i.e.*, favorably) more frequently by the well adjusted adolescents in population A than by the maladjusted, and bars extending downward represent questions which were more frequently answered "correctly" by the maladjusted. The numbers on the bars are the numbers of the questions in the test.*

In Figure 3, Section 4 shows that *the combined score of all the elements* shown in Figure 2 (the entire test exclusive of Purpose and Socialness as revealed by written wishes) *distin-*

* That is, the unrevised test, some copies of which the author has on hand and will mail on request. The revised and expanded test is published by The Association Press, 347 Madison Ave., N. Y. C. Space does not permit including more than a few examples of questions in the present discussion. But Fig. II should be of assistance to experimenters who wish to utilize some parts of the OSPA Inventory in the construction of other tests.

FIG II

DIFFERENCE BETWEEN SOCIALLY WELL ADJUSTED AND SOCIALLY MALADJUSTED ADOLESCENTS IN INDIVIDUAL TEST ITEMS

Differences shown in terms of significant ratios:— percent of maladjusted making unfavorable replies minus percent of well adjusted making unfavorable replies divided by the Probable Error of the Difference

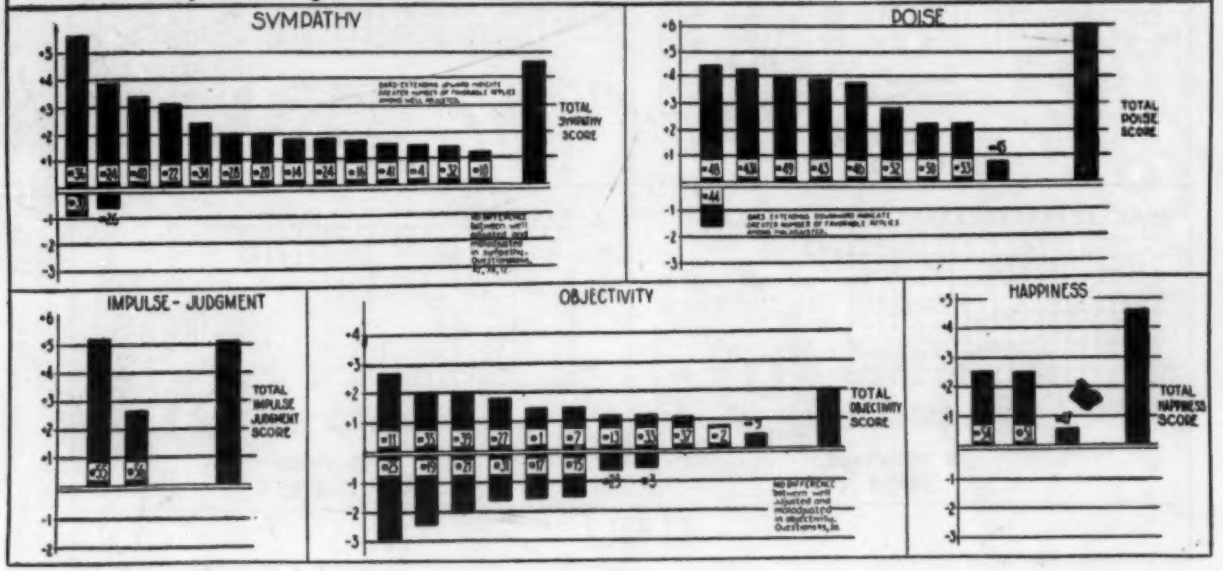
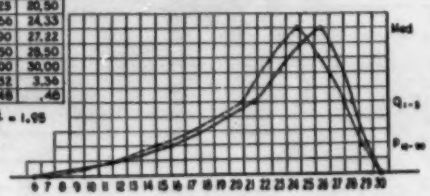


FIG III

1. OBJECTIVITY
POPULATION A

	Well adjusted	Maladjusted
Low Score	6.00	7.00
P_{10}	15.60	14.90
Q_1	21.25	20.50
Med.	25.66	24.33
Q_3	27.90	27.22
P_{90}	29.50	29.50
High Score	30.00	30.00
QD	3.32	3.36
P.E. Med.	.46	.46

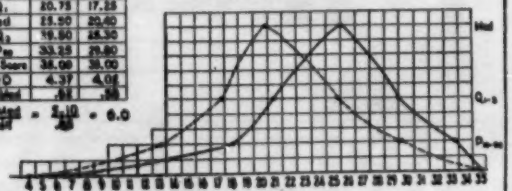
Dif. Med / P.E. dif = 1.33 / .46 = 1.99



3. POISE
POPULATION A

	Well adjusted	Maladjusted
Low Score	4.00	4.00
P_{10}	16.00	13.16
Q_1	20.75	17.25
Med.	25.50	20.40
Q_3	30.50	28.30
P_{90}	33.25	29.80
High Score	36.00	33.00
QD	4.37	4.05
P.E. Med.	.62	.58

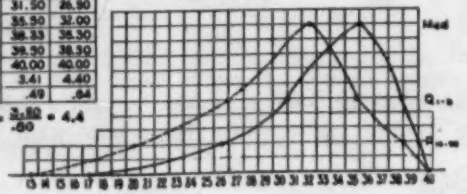
Dif. Med / P.E. dif = 5.10 / .85 = 6.0



2. SYMPATHY
POPULATION A

	Well adjusted	Maladjusted
Low Score	17.00	13.00
P_{10}	26.00	20.00
Q_1	31.50	26.80
Med.	35.50	32.00
Q_3	38.33	35.30
P_{90}	39.50	38.30
High Score	40.00	40.00
QD	3.41	4.40
P.E. Med.	.49	.84

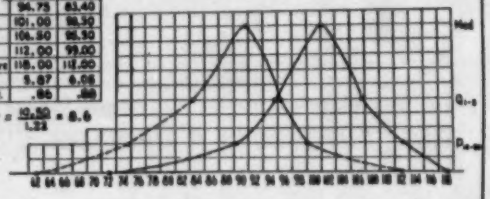
Dif. Med / P.E. dif = 3.50 / .80 = 4.4



4. TOTAL Q.S.P.
POPULATION A

	Well adjusted	Maladjusted
Low Score	72.00	68.00
P_{10}	89.25	74.75
Q_1	94.75	83.40
Med.	101.00	98.30
Q_3	106.50	98.50
P_{90}	112.00	99.00
High Score	118.00	112.00
QD	5.87	6.05
P.E. Med.	.86	.88

Dif. Med / P.E. dif = 10.50 / 1.22 = 8.6



guishes more clearly between the well adjusted and maladjusted than does the score for Objectivity, Sympathy, or Poise alone. Yet each one of these elements has some differentiating value by itself.

VII. As indicated by the low intercorrelations in Table I, the scores for the different test elements vary, for the most part, independently. Therefore these elements will be separately considered.

A. OBJECTIVITY.

The questions for this element of the test were selected and adapted, on the basis of responses made to them in many personal interviews, from Hartshorn and May's S.A. ("Lying") Test, forms I and II (2).

Following are sample objectivity questions, numbered as in Figure 2. The "correct" replies appear in parentheses:

11. Did you ever break or lose anything which belonged to some one else? (Yes)

25. Are you always on time for school and for all other appointments? (No)

35. When you see other children fighting do you always stop them? (No)

15. Did you ever tell a lie? (Yes)

These questions, and 17 others similar in nature, although originally designed as a "lying test" do not distinguish between deliberate misrepresentation and unintentional inaccuracy, but for our purpose such a distinction is unimportant. We use them to find out if either factor is conspicuously present.

Figures 1 and 2 show that well adjusted and maladjusted adolescents are about equal in their ability and willingness to answer accurately questions like those in the OSPA Inventory. In other words, their Objectivity scores are about equal.

In population A the well adjusted were found to be slightly more objective than the maladjusted, but above a roughly defined age level of about twelve years, the objectivity scores of both groups were, in general, high enough to be considered satisfactory. On *a priori* grounds, checked up by personal

interviews, a very low objectivity score was believed to invalidate the test as a whole.

Actual interviews of people who proved to be very low in objectivity gave, in most instances, especially in the case of extremely inaccurate adults, whether they were prisoners or college students, the distinct impression that it was useless to question them.

Either the individual spoke for effect and stuck to any statement made, so that no confidential relationship with him could be established, or he said the first thing that came to mind, contradicted himself readily, and became very confused when pressed too hard to speak accurately.

In some instances, however, especially with young children, interviews succeeded in giving a more definite idea of what was wanted of them, and the children were able to achieve considerable accuracy.

In cases where objectivity is not so low as to invalidate the test, but is not very high, it seems reasonable to let that fact influence the score in such a way as to give less total credit than that which is given when the objectivity is high. The simplest way to do this is to include the objectivity score in the total, so that a lower objectivity score means a lower total score.

The weight to be assigned to this element must be decided in the light of the correlations between it and the other elements. If these were highly negative (that is, if individuals who lied tended to increase their scores in the other elements of the test) the objectivity element should be weighted more than it should if the negative correlations were low. Actually, (as may be seen in Table I) *there are no appreciable correlations between objectivity and the other test elements,* either when the latter are scored separately or when they are totalled.

But the fact that the other elements are not correlated with objectivity does not argue that they are not affected by it. It merely shows that misrepresentation may as readily result in a lowering as in a raising of the various scores.

The weight finally assigned to objectivity was between one-fourth and one-third of the total.

Objectivity was found to be, during the years of adolescence, practically unrelated to age and intelligence.

In the table of correlations, Table I, we find that objectivity is more closely related to IQ and mental age than are any of the other test elements. However, where most of the children are over 14.0, as in population A, the correlation between these factors and objectivity is only .34 ± .06, (the same for M.A. and IQ. See footnote No. 1 to Table I). And where the children are younger, as in a population of 50 boys and 50 girls, 8.5 to 12.0 years old, selected at random, the correlation is even lower (.12 ± .07). In this latter group, moreover, objectivity is not correlated with either chronological age or IQ. (The coefficients are .13 and .06 respectively). Nevertheless, the *average* objectivity score was lower than that of the older group by nearly 15 probable errors of the difference.

These results may be explained by assuming that although chronological age and mental age differences in objectivity exist, they are not as great as individual differences. This conclusion was checked by finding the multiple R between objectivity and C.A., I.Q., and M.A. in a population of 172 where the ages ranged from 8 to 18. It turned out to be .61.

Again the conclusion that age and mental differences affect objectivity, but are by no means the only factors affecting it, is supported by ordinary observation.

The original testing program was carried down to the third and fourth grades, but so many of the objectivity scores of the younger children were extremely low that it was felt at first that the questionnaire in general was not appropriate for the younger children. However, some third grade children made very high scores in objectivity and, on the other hand, a few college students made very low scores. We may not say then that the OSPA questionnaire is definitely inappropriate for some ages and appropriate for others, but rather that it is appropriate for some individuals who are most frequently found among those who have reached a certain minimum mental age —probably around twelve or fourteen.

The reliability of the objectivity element was found to be .73 ± .03.

B. SYMPATHY.

The questions for this element of the test were devised on the basis of personal interviews with delinquents and non-delinquents.

Following are sample sympathy questions, numbered as in Figure II and with "correct" replies in parentheses:

36. If you had a free ticket to go and see a murderer hung, would you go? (No)

24. Did you ever cry over a book or a story? (Yes)

40. When you see other people sad does it usually make you sad? (Yes)

28. Which would you rather have a real friend or $50.00? (Friend)*

The sympathy score was found to distinguish clearly between the well adjusted and maladjusted public school children, the well adjusted being more sympathetic. In the State School, (Population C) however, the maladjusted and well adjusted were approximately equal in sympathy, and the same was true of the contrasted groups in population D, in which the maladjusted were prisoners.

Since the results in population C and D correspond closely to the results in populations A and B in all other respects but sympathy, we may conclude—tentatively at least—that institutional conditions tend to alter the significance of some of the answers to the sympathy questions.

As shown in Table I, *sympathy was found to be unrelated to objectivity, intelligence, and poise; to be positively related to wish scores* (socialness and purpose) *and to be somewhat negatively related to age within the adolescent years.*

It is noteworthy that objectivity and sympathy are unrelated to each other—that there is no consistent tendency on the

* One extremely "hard boiled" boy when asked this question in a personal interview replied, to the examiner's surprise, "Friend." When interrogated further he explained: "I could get more than $50.00 out of a real good friend."

part of either boys or girls to misrepresent their reactions to the sympathy questions in such a way as to earn a higher score. The correlation listed in Table I has been checked against correlations in two other populations. One population of 102 girls gives a coefficient of $-.07 \pm .08$, and a population of 77 boys gives the coefficient of $-.18 \pm .08$.

The fact that there is very little difference between boys and girls in the tendency to earn a high sympathy score by misrepresentation should be considered in connection with the fact that the girls in all populations earned significantly higher sympathy scores than the boys. The simplest interpretation of these facts is that the difference in score represents an actual behavior difference between the sexes as well as between the conduct groups, girls being superior to boys, and the well adjusted (both boys and girls) being superior to the maladjusted.

The lack of correlation between sympathy and I.Q., considered in conjunction with the clear cut relationship shown in Figures I and II between this element and behavior differences, indicates that this portion of the test succeeds in its purpose of measuring non-intellectual factors which are important in social adjustment.

That sympathy is not correlated with poise is rather surprising in view of the fact that the group of questions comprising the latter element appear to get at (chiefly) the sense of psychological isolation and antagonism which seem, *a priori*, to be related to the type of reaction which the sympathy questions appear to cover. However, a check correlation in a population of 50 boys and 50 girls between 9 and 12 years of age (selected at random) turns out to be only $.11 \pm .07$. We must therefore conclude that, in spite of certain points of apparent similarity, the two groups of questions measure two distinct and relatively independent types of response.

The positive correlation between sympathy and the wish element is probably traceable to the method of scoring the latter in which credit is given for wishes (or concern) for others.

The low negative correlation between age and sympathy in population A is supported by the findings in population B (See Figure V) and by results in a population of high school children retested after an interval of two years. In all populations, however, the decline in sympathy during adolescent years was relatively small.

The reliability of the sympathy element was found to be .79 ± .03.

C. POISE.

Some of the questions for this section were selected and adapted from Woodworth's Psychoneurotic Inventory (6). Others were devised on the basis of interviews. Those questions were selected or devised which appeared to get at that type of emotional stability which was our special concern—the sense of social acceptance, intimacy, ease and *rapport*.

Below are examples of poise questions, numbered as in Figure II, and followed by "correct" replies.

48. Do you ever feel that nobody loves you? (No)

43A. About how many people have you disliked or hated very much? (None. The number hated determined size of negative score.)

49. Do you feel that nobody quite understands you? (No)

52. Do people hurt your feelings very often, that is almost every day? (No)

The poise score was found to distinguish sharply between the well adjusted and maladjusted in all four populations, the well adjusted being more poised.

The median scores of the contrasted groups in population A differ, as shown in Figure III, by six probable errors of the difference, and more than 50 per cent of the maladjusted score lower than the lowest 25 per cent of the well adjusted.

Checking these results against the State School population, C, we find that in this case the difference between the well adjusted and the maladjusted is even more distinct. But in population D the median poise score of the prisoners is only 1.14 probable errors of the difference below that of the dull school children with whom they are contrasted.

Poise was found to be unrelated to intelligence and sympathy, its relationship to age was slight and different in the different populations, and it bore a negligible inverse relationship to objectivity in all populations.

The fact that Table I shows a low positive correlation ($.38 \pm .06$) between age and poise in population A, whereas in population B (Figure V) there is a slightly negative relationship (and this latter is substantiated by the results in the population of high school children retested after two years) indicates that probably age, within the limits measured, is accompanied by a more or less chance rise or fall in the sense of psychological intimacy.

The reliability of the poise element was found to be $.81 \pm .02$.

D. HAPPINESS AND IMPULSE JUDGMENT.

In Figure II we see that *the well adjusted children report themselves as happier* than the maladjusted.* Their median total happiness score is 4.6 probable errors of the difference above that of the maladjusted group. All other populations show a similar difference. The school children who were retested after a lapse of two years showed a practically unchanged happiness score (from 9.16 to 9.18).

The reliability of this element of the test is $.85 \pm .02$.

Figure II also shows how well the two impulse judgment questions* differentiate between the well adjusted and the maladjusted groups. As in the case of happiness and poise, *the results in all populations agree. The well adjusted in every case are less impulsive* (show better impulse-judgment) *than the maladjusted.* But, unlike sympathy and poise, *there is a tendency for the impulse-judgment score to improve slightly with age.*

* Sample question: No. 45. Are you happy most of the time? (Ans. Yes).

* Sample question: No. 55. If you had to choose between having a very fine automobile right now, or a million dollars next year, which would you take? (Ans. $1,000,000). The Impulse Judgment element has been greatly expanded in the revised test.

E. PURPOSE AND SOCIALNESS AS REVEALED IN WRITTEN WISHES.

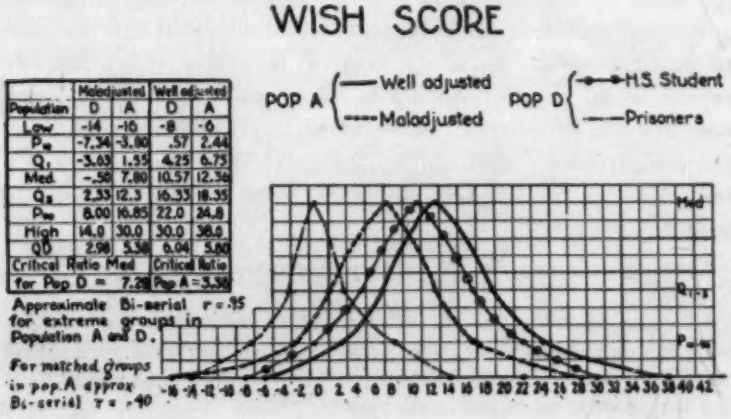
In the study of wishes reported elsewhere (7) it was found that "the three factors which distinguish most clearly between the wishes of the well adjusted and the maladjusted are (1) the degree to which attainment of the indicated goal involves sustained and definitely directed effort, (2) the degree to which "socialness" (*i.e.*, attention turned sympathetically upon the experiences of others) is implicit in the wish, and (3) the degree of implied self-criticism which shows a desire for attainable personal integration and development."

A scoring scheme was devised which rewarded these factors, and which yielded *a higher coefficient of reliability for the wish element than for any other single element of the test—namely, .88 ± .02.*

Thus scored, *the socialness and purpose element, even when standing alone, distinguishes very well between the four degrees of social adjustment* (shown in Figure IV) *the bi-serial r coefficient of validity between the two extreme groups* (prisoners and well adjusted adolescents) *being .95.*

However, when matched groups as well as extreme groups are taken into account, neither the wish element nor any of the

FIG. IV.



	Maladjusted		Well adjusted	
Population	D	A	D	A
Low	-14	-16	-8	-6
P_{10}	-7.34	-3.80	.57	2.44
Q_1	-3.63	1.55	4.25	6.75
Med.	-.58	7.80	10.57	12.56
Q_3	2.33	12.3	16.33	18.35
P_{90}	8.00	16.85	22.0	24.8
High	14.0	30.0	30.0	38.0
QD	2.98	5.38	6.04	5.80
Critical Ratio Med for Pop D = 7.28			Critical Ratio Pop A = 5.56	

other elements alone or in minor combinations have as satisfactory a validity as the total combined OSPA score.

The wish score was found to be (during adolescence) unrelated to intelligence and age, and positively related to sympathy and poise.

VIII. SEX AND AGE DIFFERENCES.

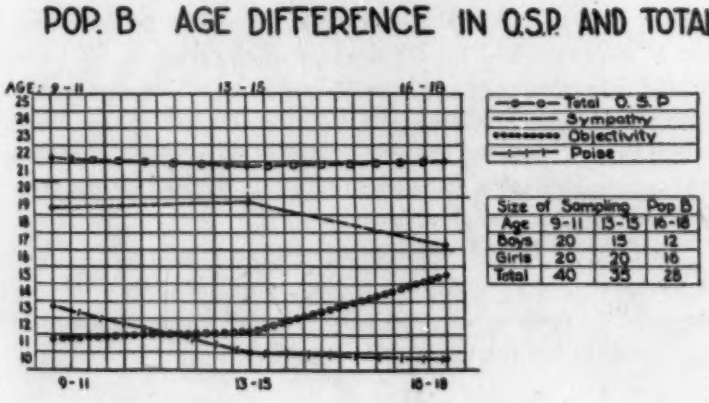
The sex differences were definite and interesting, but detailed discussion of them must be reserved for another article. It is sufficient to point out here that the *sex differences in the total score are considerably less than the behavior differences. The norms for the boys are slightly lower than those for the girls, and this may be considered as further evidence of validity,* since delinquency is commoner among boys than among girls.

The relations of the OSPA Test (and its elements) to age were determined in three ways: 1. by means of correlations, 2. by means of averages of children of different ages (shown in Figure V), 3. by means of retesting fifty high school children two years after their initial test. The results obtained by these three methods were in general agreement.

Between the ages 12 and 22 the total OSPA score was found to be unrelated to age.

There was found to be a consistent but slight drop in sympathy score during the adolescent years, and a consistent but

FIG. V.



slight rise in objectivity. Changes in other elements of the test were insignificant or contradictory.

IX. THE RELATION OF THE OSPA (SOCIAL ADJUSTMENT) SCORE TO INTELLIGENCE AND SCHOOL ACHIEVEMENT:

Factors measured by the OSPA score were found to be unrelated to intelligence.

The negligible correlation of .17 ± .05 between OSPA and IQ (shown in Table I) is further reduced to .098 when the influence of objectivity is partialed out.

In another population in which, because of the age of the children (most of them less than fifteen), the correlation between IQ and M.A. was .59 (instead of .98 as in population A) and the correlation between C.A. and M.A. was .54, the multiple R between OSPA and IQ, M.A., and C.A. was .33 ± .09. In view of the fact that the influence of objectivity was not removed and that fluctuations of sampling alone would give rise to a multiple correlation of about .17, this coefficient was also insignificant.

In a third population of high school sophomores, selected at random, we find (in Table III) a correlation between OSPA and IQ identical with that found in population A.

But these correlations are not the only evidence that OSPA measures factors which are relatively independent of intelligence. The fact that the contrasted groups in populations A and D were matched for IQ shows that the marked differences in OSPA scores could not have been due to differences in intelligence. All the evidence points to the conclusion that OSPA scores vary with behavior and independently of intelligence—that they constitute a measure of non-intellectual factors which are important to social adjustment.

The OSPA (Total) Score was found to be related to success in school in the same degree as, but independently of, intelligence. The correlation with chronological age within a single grade was in both cases negative but low.

TABLE III

Correlations from a Population of 52 H. S. Sophomores Selected at Random

		1.	2.
		I.Q.	C.A.
2	C. A.	$-.21 \pm .09$	
3	OSPA	$.17 \pm .09$	$-.20 \pm .09$

PARTIALS: $r_{12.3} = -.19$ $r_{13.2} = +.13$ $r_{23.1} = +.17$

MULTIPLE: $R_{21.3} = -.28$

In Table III we see that the slight negative correlation between OSPA and C.A. is practically identical with the correlation between IQ and C.A. This we may interpret as indicating that intelligence and personality factors are about equally responsible for advancement in school, but that neither exerts much influence in the schools covered in our experiment. The fact that when OSPA is partialled out IQ is related to C.A. by only $-.19$, and that the partial correlation between OSPA and C.A. is only $-.17$, may be read as indicating that for the most part advancement in the schools from which our population was chosen depends much more upon chronological age, school attendance, etc., than upon either intelligence or the factors measured by the OSPA test.

This interpretation is borne out by the fact that in our small random sampling of high school sophomores there were two feebleminded and two borderline cases (IQ's 70, 75, 82, 86) and 14 cases (or 27 per cent) with IQ's below 100. It happens to be true that the three individuals with the lowest IQ's have high OSPA scores, but there the inverse relationship ends, and the individual with 86 IQ has in addition to his mental handicap a very low OSPA score (the lowest in the population).

In another, younger, population taken from the same school system but including children down to the 7th grade, the correlation between OSPA and C.A. (when M.A. was partialed out)

was $-.16 \pm .06$. In this same population IQ was related to C.A. $-.26 \pm .06$ which became $-.37$ when OSP (the total score exclusive of the wish element, which in this population was lacking) was partialed out. Thus we have evidence from a check population from the same school system that factors measured by the OSPA test are related to advancement in school (*i.e.*, age within a single grade) in the same manner as, and independently of, IQ.

X. SUMMARY.

A detailed summary of results and conclusions is contained in the italicized portions of the article.

In general, it may be said that all the evidence leads to the conclusion that the OSPA Inventory affords a valid and reliable measure of factors which are unrelated to intelligence but are significantly related to social adjustment as revealed in behavior.

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THE INFLUENCE OF PAPER SURFACE ON THE PERCEPTIBILITY OF PRINT

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THE consensus of opinion is that printing paper should have little or no gloss if optimum printing conditions for hygienic reading are to be achieved. The avoidance of the glare and strain is considered to be of first importance. The question of whether glazed paper actually reduces the perceptibility of print has seldom been raised however. In the single experimental report available, Roethlein[1] found no difference in the perceptibility of letter groups printed on coated white paper and on rough-finished, very slightly yellowish paper. She determined the average distance from the eyes at which the letters could be perceived. Our purpose is to measure by the distance method the perceptibility of words printed on paper with varying degrees of glaze.

The apparatus employed has been described elsewhere.[2] Two equivalent (in familiarity) series of 64 easy five letter words were printed in Scotch Roman on white paper stock. Series A was printed on egg-shell which has a rough surface and series B on both artisan enamel which has a moderate degree of gloss, and flint enamel which has a high degree of gloss. Each series of words was arranged in four lines of four words each on white cards. Each of the subjects read the words of series A printed on egg-shell (the standard) and series B on either artisan enamel or flint enamel. Practice and fatigue effects were controlled by systematic variation of the series. The comparisons made, the subjects used and the results are given in Table I.

[1] B. E. Roethlein, The Relative Legibility of Different Faces of Printing Types, Amer. J. Psychol., 1912, 23, 1–36.

[2] M. A. Tinker, The Relative Legibility of Modern and Old Style Numerals, J. Exper. Psychol., 1930, 13, 453–461.

TABLE I

The Effect of Variations in Paper Surface on the Legibility of Print

Each mean score is the average distance in centimeters from the eye at which the words were first read correctly. Each mean is also the average of 320 reading scores. Differences are for the mean score on word series A, 10 point, Scotch Roman, printed on egg-shell paper stock minus the mean score on word series B, 10 point, Scotch-Roman, but varying with respect to paper surface as indicated. In each test group, five undergraduate students at the University of Minnesota made 64 readings each for the standard (egg-shell) and for the variable.

PAPER SURFACE	MEAN	σ_M	DIFFERENCE BETWEEN MEANS IN CM.	DIFFERENCE BETWEEN MEANS IN PER CENT	$\frac{D}{\sigma_{diff.}}$
(1)	(2)	(3)	(4)	(5)	(6)
Egg-shell paper stock	145.06	2.72	−0.12	0.08	0.03
Artisan enamel paper stock	145.18	2.71			
Egg-shell paper stock	141.75	1.60	−2.32	1.66	1.01
Flint enamel paper stock	139.43	1.64			

All subjects did not give differences in the same direction on comparison of the enamel with the standard (egg-shell). For artisan enamel there were 1 minus and 4 plus differences, and for the flint enamel, 2 minus and 3 plus differences. This lack of uniformity plus the trend of the data in Table I show that there is little variation in perceptibility of words from one paper surface to another. The differences between the average distances are small and relatively unstable. Apparently there is then no consistent or appreciable effect of variations in paper surface upon the perceptibility of words.

Our results agree very closely with those secured by Roethlein (*op. cit.*) who employed a similar method. They also agree with the results of Paterson and Tinker (reported by Tinker[3]) who investigated the influence of paper surface on speed of reading. Variation in paper surface had no differential effect on the speed of reading. The continuous working period was comparatively short in both these studies and hence the factor of fatigue probably did not enter, especially

[3] M. A. Tinker, Studies in Scientific Typography, Psychol. Bull., 1932, 29, 670–671.

since the illumination had a fair degree of uniformity in both experimental situations.

Ferree and Rand[4] point out that the type (specular) of light reflection which occurs from glazed surfaces is very fatiguing and harmful to the eyes unless indirect lighting is used or some method is employed for diffusing the light. It is obvious, therefore, that the amount of glaze permissible in printing paper depends largely upon the system of illumination to be used for reading.

Summary. An investigation of the influence of egg-shell, artisan enamel, and flint enamel paper surfaces upon the perceptibility of words failed to disclose any differential effect during short working periods. The alleged eye-strain from reading material printed on glazed paper must be due entirely to continuous reading in light not uniformly dispersed rather than to inability to see the print satisfactorily.

[4] C. E. Ferree and G. Rand, Lighting and the Hygiene of the Eye, Arch. Ophthal., 1929, 2, 1–26.

A COMPARISON OF AN ELECTRIC CIRCUIT TRACING TEST WITH THE O'CONNOR WIGGLY BLOCK TEST

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MOST of the mechanical ability tests for adults require the assembly of some type of form board or the working out in simplified manner of some industrial task. Neither type is quite satisfactory for the general adult population. As a rule the form boards are too uninteresting and too dependent upon chance factors for their solution and the industrial tests are too specialized. The better form board tests attempt to avoid the chance factor by presenting several similar problems, as in the Kent-Shakow test,[1] or by repeating the same problem as in the O'Connor Wiggly Block Test.[2]

The author has devised a test for electric circuit tracing that seems to offer some advantages. It is easily constructed, it takes but a short time to administer, it does not seem to be greatly affected by lack of electrical experience, it is suitable for both high school pupils and for adults, and it offers several alternative problems for solution. As far as the author is aware it is quite unlike any of the well known mechanical ability tests. Peculiarly enough it seems to prove as satisfactory for women as for men.

This paper deals with a description of the electric circuit tracing test, which hereinafter shall be designated as the ECT test. For comparison's sake data are also presented from the O'Connor Wiggly Block test that was given to the same S_s.

Description of the Apparatus.

On a flat board 15 inches square are placed 5 electric lamps and sockets, one plug receptacle, and 4 button switches. The

[1] G. H. Kent and D. K. Shakow, Graded Series of Formboards, Personnel Journal, 1928, 115–121.

[2] Johnson O'Connor, Born that Way. Williams and Wilkins, Baltimore, 1928, p. 209.

wires connecting the apparatus are exposed and arranged in straight lines so that the circuits may be easily traced. The switches are all of the four way type, but three of them, (Nos. 1, 3 and 4) have two of their adjoining contacts cut off so that they can complete only one circuit. Indicators are fastened to the buttons of these switches so that for each contact position the indicators show how the circuit is completed. It is to be noted that no connection is made diagonally through the switches, all connections being right angled.

Procedure:—

The apparatus with the switches set in incorrect positions is placed on the table in front of S and the purpose of the experiment is explained to him. He is required to trace the current from the source in such a way that a designated lamp is illuminated, all the other lamps remaining unlighted. This is possible in only one way by a proper manipulation of the switches. The directions are as follows:

> This is a problem in lighting an electric lamp. You know that the current must pass along a wire and through a lamp to light it. Also the current must come in through the plug and go out by it. There is an indicator on each switch to show where the current passes through it. When you have been told which lamp to light you will start to trace the current on the word "Begin." When you have traced the circuit, say "Ready." Then set the switches and see if your solution is correct. If the proper lamp does not light you will be given another trial."

The centre lamp is then designated and S begins to trace the circuit. The naming of the lamp is withheld till the end of the instructions to prevent S from starting the problem ahead of time. To facilitate the solving of the problem S is also instructed to trace with a pencil on a diagram showing four circles corresponding to the four switches, the proper setting for each switch. When he says "Ready" the time in seconds is taken and the switches are then set. If the proper lamp fails to light he is given other trials till he is successful. A ten minute working time limit is set.

Many of the S's took in addition to the ECT test, the Wiggly Block test, described by O'Connor as Worksample no. 5.[3]

[3] *Op. cit.*, p. 209.

The procedure and instructions advocated by him were followed exactly and three trials were given to each S.

All the testing was done by senior students in Psychology who were carefully trained in the procedure to be followed. As the instructions were written out and read to the S's, the data, though gathered by different E's, may be taken as reliable.

Subjects:—

The S's who took the test were divided into several groups because the testing took place over a period of four years according as different objects presented themselves for investigation.[4] In this article the groups will be designated as follows:

Group A: 71 Engineering students, all men.
Group B: 50 men Arts students.
Group C: 50 women Arts students.
Group D: 75 men students in Arts and Engineering.
Group E: 122 men students in Arts.
Group F: 103 boys in 1st and 2nd year Technical School. Generally speaking they were both older and duller than ordinary High School students in these same grades.

The age distributions of S's are given in Table I.

Method of Scoring:—

The score of the ECT test is the total time obtained by adding the times of all the individual trials. A solution must be found within ten minutes working time. The time for each trial commences at the command "Begin" and ends when S says "Ready" just before setting the switches. Most of S's took only one trial and all but a few were right on the first

[4] The data were gathered by the following students to whom the author wishes to express his appreciation:

Group A, Messrs. Johnson and Semmens.
Group B, Messrs. Marsh and DeLeeuw.
Group C, Misses Foster and Roberts.
Group D, Messrs. Cameron and Mark.
Group E, Messrs. Armstrong, Jones, Murray and Paege.
Group F, Messrs. Barnes, Davison, Penny, Sheppy, Steele and Tucker.

TABLE I

Distribution of Chronological Ages

AGES	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29–30	TOTAL
Group A ...			1	5	12	16	14	9	6	2	2	3	1				71
" B ...			1	2	11	3	5	4	6	2	4	3	3			6	50
" C ...			1	2	15	7	9	5	3	5	2	1					50
" E ...		2	4	12	24	23	19	14	12	7	5						122
" D ...				4	12	15	11	12	8	6	1	3	2	1			75
" F ...	9	24	24	24	14	6	1				1						103
Total	9	26	31	49	88	70	59	44	35	22	15	10	6	1		6	471

Age 16 is from 16 years 0 months to 17 yrs. 0 months.

few trials. The frequency distribution of 135 S's, according to the number of trials taken is given in Table II.

TABLE II

Distribution of the Number of Trials in the ECT Test

NO. OF TRIALS	1	2	3	4	5	6	7	S_n
Group A	51	14	1	2	1	1		70
" B	16	5	1	1	1		1	25
" C	22	11	6	1				40
Total	89	30	8	4	2	1	1	135

To score the Wiggly Block test the procedure advocated by O'Connor for weighting the tests was originally used and called the O'Connor score. It is cumbersome since it entails corrective factors for age and for learning from trial to trial. The O'Connor scores were computed for 121 S's from Group A and Group B men and correlated with the average times of the three trials. As the raw correlation coefficient (Pearson Product Moment) is high, $0.94 \pm .01$, the average score of the three tests was used throughout as the Wiggly Block score and called $OC_{Av.}$

At the outset of this work corrective factors were also used in the ECT test and the scores were compiled based upon learning, age and experience. When the scores thus obtained from 71 Engineers were correlated with those obtained by the simpler method of taking the total time, the Pearson r was 0.89 with a probable error of 0.02. Hence the method was followed throughout this experiment of taking as scores the total time in seconds for the ECT test and the average time in seconds for the three trials of the O'Connor test.

Results:—

For purposes of comparison the results are given for each group of S's. Tables III and IV give the means and the standard deviations of the distributions for each trial of the O'Connor test, for the O'Connor average, and for the ECT test. Group E did not take the ECT test, and of the 75 S's of Group D, the values for 25 S's only are given, because they alone of

group D started with the centre lamp. No S in Group D did the O'Connor test. Hence 396 S's in all did the O'Connor test and 299 took the ECT test.

TABLE III

Group Means. (In Seconds)

GROUP	N	OC_1	OC_2	OC_3	$OC_{Av.}$	ECT
A	71	230	172	103	173	277
B	50	237	129	95	155	209
C	50	214	159	119	164	165
E	122	155	122	106	124	.....
F	103	256	175	117	187	211
D	25	.....	.....	.....	.....	253
Total 1	396	215	151	113	174	.....
Total 2	299					212

TABLE IV

Standard Deviations of Distributions. (In Seconds)

GROUP	N	OC_1	OC_2	OC_3	$OC_{Av.}$	ECT
A	71	137	121	47	96	159
B	50	141	86	43	70	116
C	50	103	94	65	69	76
E	122	100	81	68	70	.....
F	103	161	120	67	113	158
D	25	.....	.....	.....	.....	170
Total 1	396	139	106	71	85	.....
Total 2	299					127

The means and the standard deviations are fairly consistent, with Group C, the women, tending to be faster than the others in the Electric test, and Group E having the shortest times in the O'Connor test. It is to be noticed that the S's cut down their time by roughly 30 per cent from one trial to another of the O'Connor test, in both the means and the standard deviations.

Table V gives the distributions of the scores (times in seconds) made on the various tests. Four distributions are given for each test, those of the 243 university men, those of the 50

TABLE V

Frequency Distribution of Scores on Tests

TIMES IN SECONDS	OC_1				OC_2				OC_3				$OC_{Aver.}$				ECT			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	V	II	III	VI
600	4			4	2			2	1			1			2	2	3		6	9
570	3		10	13			4	4											1	1
540	1	1	1	3																
510	2	1	2	5	1			1											1	1
480			3	3	2		1	3	2			2	1		1	2	15		2	17
450	2		1	3									3		3	6	3		1	4
420	5		3	8			1	1					2		1	3	5		2	7
390	1		3	4	3	1	1	5					1			1	5		1	6
360	8	2	1	11	2	3	2	7	2			2	2	1	1	4	1		5	6
330	10	1	4	15	4	1		5	1	1		2	2	2	2	6	3	2		5
300	13	2	5	20	3	1	4	8		1	1	2	4	1	3	8	11	2	3	16
270	7	4	2	13	2		3	5			3	3	8		6	14	4	1	3	8
240	12	8	6	26	11	3	4	18	3	1	2	6	13	2	3	18	5	4	7	16
210	9	5	5	19	7	1	3	11	9	1	6	16	21	3	10	34	18	3	7	28
180	24	6	12	42	18	6	13	37	6	3	7	16	34	5	11	50	12	6	7	25
150	21	7	11	39	24	5	11	40	14	5	9	28	43	10	14	67	14	6	10	30
120	43	1	12	56	29	9	16	54	35	7	12	54	51	13	16	80	20	13	14	47
90	30	8	15	53	37	6	16	59	54	9	17	80	44	16	9	16	9	4	8	21
60	35	4	7	46	64	10	15	89	65	18	23	106	14	4	12	30	10	7	14	31
30	13			13	34	4	9	47	51	4	23	78			2	2	7	2	11	20
0																	1			1
N	243	50	103	396	243	50	103	396	243	50	103	396	243	50	103	396	146	50	103	299

I. University Men — N = 243 — Groups A, B, E.
II. University Women — N = 50 — Groups C.
III. Technical School Boys — N = 103 — Groups F.
IV. Total 1 Subjects — N = 396 — Groups A, B, E, C, F.
V. University Men — N = 146 — Groups A, B, D.
VI. Total 2 Subjects — N = 299 — Groups A, B, D, C, F.

university women, those of the 103 Technical school boys, and those of all the 396 subjects. In the ECT test tabulation there are 146 university men, 50 university women, 103 Technical school boys, making 299 subjects in all.

Table VI gives the Pearson Product Moment correlations between the various trials of the O'Connor test and between the ECT test and the O'Connor average. In general there is good agreement between the results of the various groups, with the exception of the correlation between the first and the second trials of Group B. In this case the zero correlation is probably attributable to the fact that most of the S_s with poor

TABLE VI

Correlations between Tests

GROUP	N	OC_1–OC_2		OC_1–OC_3		OC_2–OC_3		ECT–$OC_{Av.}$	
		r	P.E.	r	P.E.	r	P.E.	r	P.E.
A	71	0.50	.06	0.22	.08	0.68	.04	0.29	.07
B	50	0.01	.10	0.27	.09	0.36	.08	0.44	.08
C	50	0.58	.07	0.37	.08	0.52	.07	0.37	.08
E	122	0.43	.05	0.48	.05	0.66	.03	.....	.....
F	103	0.41	.06	0.43	.06	0.44	.05	0.37	.06
A & B ..	121	0.15	.06	ECT–OC Score					
A & B ..	121	0.22	.06	ECT–OC_1					
A & B ..	121	0.94	.01	OC Score–$OC_{Av.}$					

III. Technical School Boys N = 103 Groups F.
IV. Total 1 Subjects N = 396 Groups A, B, E, C, F.
V. University Men N = 146 Groups A, B, D. C, F.
VI. Total 2 Subjects N = 299 Groups A, B, D, C, F.

scores diminished their times very much in the second trial, while the S_s with good scores did not vary much. This of course is what generally happens, but it is particularly so in this case, as there were 6 older S's who were quite slow on their initial test.

For Groups A and B, (121 S's) three correlations are tabulated for the purposes of comparison. The O'Connor score, that is with the weighting devised by O'Connor, is correlated against the ECT score and the average score on the three O'Connor trials. As has been noted above the simpler method of scoring the O'Connor test has been followed throughout this study with the exception of this instance, owing to the high correlation (0.94) between the two methods of scoring. In order to ascertain the effect of the initial attempt on the

tests, the first trial on the O'Connor test was correlated with the ECT score, the resulting correlation (0.22) was quite low, and much less than the average correlation (0.37) between the O'Connor Av. and the ECT score.

Comparison of the Scores of Men and Women Students:

Groups B and C consisted of equal numbers of college students in Arts, 50 men in one group and 50 women in the other. The women average about 2 years younger than the men, chiefly owing to the fact that 6 of the men were between 28 and 33 years of age. The mean age of the women is 20.3 years, that of the men is 22.4 years.

When the mean times of the men and of the women of these groups are compared there is but a slight difference, 9 seconds, in favor of the men for the O'Connor test, and a difference of 44 seconds in favor of the women for the ECT test. Neither difference is reliable: the ratio of the difference of the means to the standard error of the difference,[5] being for the O'Connor average 0.7 and for the ECT, 2.2. The mean scores of the men of Group B for the tests agree quite well with those of the total group.

The university women have scores close to the mean of all S's for the O'Connor average, but a much smaller score than the mean score of all S's for the ECT. The group of women is too small and too select to make the difference reliable. At any rate we can infer that the women seem to be able to do both tests as well as the men in spite of their supposedly lesser experience in mechanical and electrical matters. It is to be noted that all the college students both men and women have had laboratory experience. On the other hand there is no reliable difference found in the test scores between students with and those without electrical experience other than that met in daily life.

Validity and Reliability of the Tests:

Any statement of the nature of the abilities measured by the ECT test would be conjectural. One might state that

[5] H. E. Garrett, Statistics in Psychology and Education. Longmans, Green; 1926, p. 128.

fundamentally it presents a concrete problem involving a minimum of technical knowledge which must be thought through in spite of changing difficulties. *It is as it were a mental maze.* The S must retain in his mind, at each new phase of the problem, the correct solutions already found. The investigation of the various paths presenting themselves at each joint in the wiring and the selection of the correct ones after working backward in many cases, demand, not mere logical reasoning, but an ability to think in concrete terms and to select and to retain correct judgments while concentrating on new phases of the problem.

Such an ability is demanded in many occupations. There does not seem however any one skill by which this test can be validated. Accordingly only an approximate idea of its validity may be gleaned by comparing it with a well-known test like the O'Connor Wiggly Block test. Then with fairly homogeneous groups such as the Technical school students and the Engineering students, whose mechanical abilities are definitely measured in a number of their tasks, an attempt can be made to find at least an indirect measure of its validity. Thus in Table VII are presented correlations from 59 S's of group A, all first and second year engineering students who

TABLE VII

Correlations between Instructors' Ratings and Tests. Engineering Students

		ECT	$OC_{Av.}$	FW	HR	M.A.
N = 59	$OC_{Av.}$	0.29				
	FW	0.03	0.11			
	HR	0.22	0.06	0.55		
	MA	0.26	0.10	0.33	0.60	
	CA	0.03	0.08	0.06	0.21	0.16

ECT —Electric Circuit Tracing Test.
$OC_{Av.}$—O'Connor Test, Average of Three Trials.
FW —Instructors' Rating in Field Work.
HR —Instructors' Rating in Laboratory Courses.
MA —Scores on College Entrance Test.
CA —Chronological Age.

had taken laboratory courses and field work. Scores made by these students on the freshman test of the American Council of Education were also available. These freshman scores were equated to the same year, 1930, according to the table furnished by the compilers of the test.[6] In the intercorrelations they are known as the MA scores; their correlations with the tests are almost negligible. The ratings given by a committee of instructors, based upon proficiency in field work are designated FW, and the laboratory ratings given by an instructor as HR. The scores made in the O'Connor test and the ECT test are known as $OC_{Av.}$ and ECT respectively.

Table VIII gives a composite rating from the instructors of the 103 Technical school boys, obtained by averaging the

TABLE VIII

Correlations between Instructor's Ratings and Tests. Technical School Boys

		ECT	$OC_{Av.}$	IR
	$OC_{Av.}$	0.37 ± .05		
N = 103	I.R.	0.10 ± .07	0.38 ± .05	
	CA	0.02 ± .07	−0.16 ± .06	−0.12 ± .06

ECT —Electric Circuit Testing Test.
$OC_{Av.}$—O'Connor Test, Average of Three Trials.
I.R. —Instructors' Rating in Practical Work.
C.A. —Chronological Age.

marks of S's in all their shop courses. For 58 first year S's of this group the marks given in the practical courses of woodwork and electricity are correlated with the O'Connor and the ECT tests: these correlations are given in Table IX. Inasmuch as the O'Connor test is claimed to be a measure of mechanical ability a clue to the validity of the ECT test is obtained by the correlations between the two tests given in Table VI, where r ranges from 0.29 to 0.44 for groups A, B,

[6] L. L. Thurstone and T. G. Thurstone, Psychological Examination for High School Graduates and College Freshmen, Manual of Instructions, American Council of Education, 1932.

TABLE IX

Correlations between Shop Courses and Tests. First Year Technical School Boys

		ECT	$OC_{Av.}$	WOODWORK
	$OC_{Av.}$	0.37 ± .07		
N = 58	Woodwork	0.15 ± .09	0.17 ± .09	
	Electricity	0.21 ± .09	0.30 ± .08	0.39 ± .07

C, and F. In general, the correlations are low, positive and most of them are reliable. Apparently the abilities measured by these tests have but little in common with instructors' ratings. This of course is what one might expect from previous studies of Mechanical Ability tests.

The reliability of the ECT test has not been determined. Obviously in this test the same problem could not be given a second time as the S's could too easily memorize the setting of the switches. Instead three entirely different problems involving various lamps have been worked out and data on them will be given in the next section. They give a rough method of estimating the reliability of this test.

The reliability of the O'Connor test could hardly be obtained in the usual way, either by the split half method, because there are only three trials for each S, or by a repetition on another occasion of the three trials. Each subsequent repetition of the test tends to reduce the scores of S's to much the same values; moreover the S's have a tendency to memorize the positions of the blocks, either by their grain or by their coloring. Hence the reliability of this test as ordinarily determined has not been worked out in this study but a rough idea of its value may be obtained from the intercorrelations of the three trials given in Table IV. Thus the average value of the intercorrelations of the three O'Connor trials is 0.43. Applying the Spearman-Brown formula[7] we get 0.68 to be the approximate reliability of this test. The narrowness of the

[7] Garret, *op. cit.*, p. 269.

range of the groups tested due to their homogeneity would tend to keep this value quite low.[8]

Additional Problems on the ECT Test:

An attempt was made to increase the reliabiilty of the ECT test by formulating problems other than that of lighting the centre lamp C. Fortunately the circuit can be made to light other lamps or combinations of lamps. Two problems seem most suitable for this test, the lighting of lamp D and the lighting of lamp A. Lamp D involves the setting of all four switches, while only switches 3 and 4, those on the right, are required to light lamp A.

A comparison of the relative difficulty of lighting lamps C, D and A was made, using as S's the 75 college men of Group D. The instructions and procedure were identical with those described in the other experiments except that it was made clear to the S's, that to light lamp A only switches 3 and 4 need be used. As lamp A is the most difficult problem this explanation was needed to make the problems comparable in difficulty. In order to partial out the factor of practice which reduces the time from problem to problem by as much as 40 per cent all possible combinations of the lamps were tried. This procedure unfortunately gave but a small number of S's, 10 or 15 per combination. The results therefore are but tentative and when averaged give only a preliminary comparison of the relative difficulty of the three problems. Table X gives the means of each problem. Lamp A is considerably more difficult than either C or D which are about equal in difficulty; the mean time irrespective of the combinations being 238, 164 and 172 seconds for A, C and D.

Evidence of the relationship between the difficulty and the serial order of the problems may be seen in table XI which gives the mean times of the problems according to their order of presentation. They are, for problems I, II and III, 259, 198 and 117 seconds respectively.

In table XII are given the distributions of the number of trials according to problem and according to the order in the

[8] T. L. Kelley, Statistical Method, Macmillan, 1924, p. 221.

TABLE X

Comparison of the Combinations of the ECT Tests. Mean Times of the Problems

COMBINATION	DCA	ACD	CDA	ADC	DAC	CAD	ENTIRE TEST
N	15	10	10	15	10	15	75
CA	247	253	263	246	262	246	252
MA	125	296	176	318	263	256	238
MC	129	174	259	95	98	239	164
MD	265	100	153	206	156	117	172
Average Time	173	190	196	207	173	204	

Order of presentation of problems indicated by the letters of the combination.

N—Number of S's.

CA—Chronological Age in months.

MA, MC, MD—Mean times in seconds for lamps A, C, D.

TABLE XI

Mean Times of the Problems of the ECT Test. According to the Order of Presentation

ORDER	I	II	III
Lamp A	309	259	145
Lamp C	247	151	96
Lamp D	222	185	110
Average	259	198	117

TABLE XII

Frequency Distribution of Number of Test Trials on the ECT

		C	D	A	I	II	III
	1	60	62	47	46	55	68
	2	9	8	18	16	13	6
N = 75	3	3	1	6	6	3	1
	4	2	3	3	6	2	
	5	1	1	1	1	2	
Total		100	98	118	125	108	83
Average per S		1.33	1.31	1.57	1.67	1.44	1.01

C.D.A. Lamps CDA.

I, II, III. Order of Presentation of Problem.

series. From the totals it is seen that the order of the problems affects the number of trials per problem more than does the difficulty. On the average there are 1.4 trials per problem and 75 per cent of the S's solve the problems on their first trial.

It is evident that practice effects are quite high and mask the relative difficulty of the problems. There is approximately a 25 per cent diminution of time from problem I to problem II, and 40 per cent from problem II to problem III. Hence the order of the problems is of great importance in this test. It is suggested that the problems be presented in the order C, D, A, thus reserving the most difficult problem for the last, and enabling one to compare the times of problem C, when it is the initial test, with those given in this paper for 299 S's.

Correlations between Problems:

In Tables XIII and XIV are given the correlations between the problems of the ECT test. The former lists the correlations between each of the combinations of problems. It is calculated by the Spearman Rank Difference method, as N is either 10 or 15, and the p's obtained are changed into *r* values.[9] In this table are shown the values for each pair of prob-

[9] Garrett, *op. cit.*, p. 192.

TABLE XIII

Correlations between Problems of the ECT Test According to Combinations of Problems

COMBINATIONS	DCA	ACD	CDA	ADC	DAC	CAD	AVERAGE FOR ORDER
N	15	10	10	15	10	15	
I– II	0.15	0.38	0.17	0.32	0.58	0.22	0.30
I–III	0.01	0.26	0.50	0.33	0.42	0.12	0.27
II–III	0.27	0.24	0.25	0.42	0.56	0.50	0.36
Average for Combination	0.14	0.29	0.31	0.36	0.52	0.28	0.32

N—Number of S_s.

Combinations are indicated by letters, and order of presentation of problems, by Roman numerals.

lems, and for each pair in the order in which the problems are taken. When the individual combinations of problems are segregated, the average correlation found for both these sets is about 0.32 with a P.E. that is at least as high as ± 0.20. The average results accordingly are of doubtful reliability, though some of the individual correlations are probably reliable and are over 0.50.

TABLE XIV

Correlations between Problems in Random Order

N = 75

PROBLEMS	A	D			I	II
D	0.19			II	0.39	
C	0.03	0.01		III	0.33	0.21

In table XIV which gives the correlations of the problems irrespective of combination and for all the 75 subjects, the results are seen to be dependent upon the order of presentation of the problems. The average correlation according to serial order is 0.32, as in the former table, but the intercorrelations of problems D, C, and A no matter what their order in the series are zero. Here again the effect of practice is of the greatest importance.

For the reasons previously mentioned there is no practical method of obtaining the reliability of the ECT test. A rough measure of its reliability is obtained, however, by using the Spearman-Brown formula, which gives a value of $r_x = 0.59$. Owing to the fact that the group is highly selected and homogeneous, this is probably a minimum value.

Comments:

From the remarks of the S's the O'Connor test looks much easier than it really is, and the S's are prone to be careless in their first attempts. The ECT test on the contrary seems to the S's to be too difficult, particularly if they have not had much electrical experience. Nevertheless, the solution is found much more easily than they expect and but few of the S's fail

to finish within the time limit set of ten minutes. Especial care must be taken to see that the S's understand the instructions, for poor scores are often due to this reason.

Random methods of working are frequently used in the O'Connor Test and sometimes the S's attempt to solve the problem by recalling the position of individual blocks, as identified by their coloring, grain, or other features. It is impossible to use mere trial and error in the ECT test. For one thing there are 128 possible combinations of the switches only one of which is correct; but especially the method used of having the S's mark the correct position of the switches before they are set or even before the current is plugged in, absolutely prevents random efforts.

As before mentioned experience did not seem to be such an important factor. Probably the caution used by experienced electricians to check their work before setting the switches makes for higher scores, as is seen by the relatively slow times taken by engineering students. Personality factors are of course of tremendous importance in this as in most tests. Undue caution, nervousness, tension, worry about psychological testing generally, affect the scores of some individuals more than others. Here as in all tests the mode of performance is more significant than the mere score.

Summary:

1. An Electric Circuit Tracing Test suitable for adults is described and partially standardized.
2. This test is compared with the O'Connor Wiggly Block test for which a simple method of scoring is devised.
3. Frequency distributions of scores are given for 396 S's for the O'Connor test and for 299 S. for the ECT test. The S's are divided into six groups.
4. Means and standard deviations are worked out for all the tests and for the various groups.
5. The university women do as well as the university men on these tests.

6. The relative difficulty of three problems on the ECT test is determined.
7. Correlations between the various tests are given.
8. The validity of the ECT test is approximated by its correlations with the O'Connor test and with instructors' ratings in shop and laboratory courses.
9. A rough measure of the reliability of the tests is obtained by using the Spearman-Brown formula. Values obtained are: for the O'Connor test $r_x = 0.67$ and for the ECT test $r_x = 0.59$. Owing to the selection of the subjects these are probably minimum values.
10. The mode of performance of the S's is of importance in interpreting the test scores.

THE RELIABILITY AND CONSISTENCY OF INDIVIDUAL DIFFERENCES IN MOTOR CONTROL. II*

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SINCE it was shown in a preceding article* that steadiness records show considerable variability from time to time, we are still faced with the problem of securing an accurate index of that ability. It was apparent that certain conditions affecting the records remain relatively constant for the particular sitting but change when records are made at another time. These effects are considered as constant errors for the particular sitting but from the standpoint of repeated testings and true scores they may be considered as variable errors. If these errors behave as other variable ones, then one might secure an accurate index of steadiness by merely repeating the tests so that they have a chance to cancel each other. The reliability of our index obtained from repeated sittings should increase to the extent predicted by the Spearman-Brown formula in case the time interval is kept constant or in case the time interval has no particular effect on the relationships.

From the standpoint of securing an accurate and consistent index of the individual's steadiness, it was indicated in the previous study that one might better cut down the length of the sittings but increase them in number. The labor involved in such a testing program is much more than for the procedure where all of the trials are given at a single sitting since there is generally great difficulty in securing subjects in case repeated sittings are involved. Since the check of the Spearman-Brown formula requires that twice as many sittings be obtained as would ordinarily be required to establish a certain reliability, the testing of a sufficient number of subjects

* Part I of this study is published in the February, 1935, issue of this Journal.

(in order to secure stable correlations) at regular intervals to make a check of the formula would be almost an insurmountable task under the ordinary conditions of securing subjects. The present research was facilitated by the cooperation of the University of Minnesota Military Department, since they allowed the experimenter to test the subjects during the regular drill periods. This arrangement made it possible to test all of the 80 subjects individually during a two day period and the sittings for each subject therefore could be repeated at two day intervals. Since the subjects were tested the same hour each day and in the same order during that hour the time interval between tests was relatively constant.

The number of trials in each of the sittings was cut down to six because the previous study showed the contribution of the additional trials to the test-retest reliability to be negligible. On the basis of the earlier work this would give an odd-even reliability of .96 and it would cut down the test-retest reliability by only .01 from that possible with ten trials. It was proposed that ten sittings be given since that would make it possible to check the prediction for an increase in the length of the test by five times the original length. On the basis of the previous test-retest reliability, this increase should bring the reliability to be empirically checked to .93 and the reliability of the total number of sittings to .96.

As the testing progressed, it soon became obvious that one could not assume the various sittings to represent random samples of a more or less static ability. The practice effect for the short interval of time between the sittings was considerable and the curve of mean scores shows a consistent and steady decrease. The results are presented in Table VI.

TABLE VI

Practice Effect for Repeated Sittings. (Two Day Interval.)
Drill Group (N = 80)

SITTING NO.	1	2	3	4	5	6	7	8	9	10
Mean per Trial	18.12	14.62	13.19	13.10	12.10	10.54	9.21	8.23	7.46	9.02
Sigma	9.50	9.06	7.98	8.84	8.41	7.24	7.21	6.53	5.98	7.50
Odd-Even r	.96	.95	.96	.96	.95	.96	.95	.96	.96	.97

Both the means and the standard deviations are recorded in terms of the number of contacts per trial and not as the number of contacts for the entire six trials. In this way it is easier to compare records having a varying number of trials per sitting and the averages in this table may be compared with the results of Table IV of the preceding article. A comparison of the two shows that the average of the first sitting is below that of the previous study (18.12 *vs.* 21.62) but the standard deviations are about equal.

An inspection of Table VI shows that both the means and the sigmas decrease up to tenth sitting and then there is a regression. This regression was induced by the introduction of an emotional set in the individuals. This variation in the experimental conditions was introduced to test out the author's hypothesis that a part of the practice effect was due merely to the loss of the emotional element of the test situation. It was thought that an introduction of a reward for superior performance on the last trial might produce enough tension in the individuals to increase their records. This situation would be somewhat comparable to the experimental set-up used by Laird to determine the influence of razzing except that no distraction was introduced during the examination.

The actual testing conditions, time and method of selection of the subjects, etc., were the same except that the test was prefaced by the following remarks: "This is the last chance you will have to show your ability on this test and on the basis of today's record we are going to determine which individuals are going to be allowed to shoot on the rifle range instead of taking drill. On the basis of the first nine sittings this is your record and this is your rank in the group of 80 being tested (record sheet with name in order of rank with score opposite.) Everybody will have a chance to win since the five men that show the greatest improvement, *i.e.*, change the most ranks, will be able to shoot as well as the five men that make the best score on the basis of today's records." These remarks were followed by a few statements showing

what a good chance each man had to win and with the final caution that he should do his best. Throughout the last sitting there were no further remarks made and the experimenter maintained a passive and neutral attitude.

The effects of this procedure on the means and the sigmas has already been pointed out, but it will be noted that there is no appreciable effect on the odd-even reliability. In fact, the odd-even reliability is not even affected by the changes in the means and the sigmas throughout the series of trials. This indicates that the individuals change (for the slight time interval involved between the trials) relatively the same amount whether it is in the first sitting or the last one, and that the odd-even reliability does not reflect the changes in the experimental conditions because of the way in which it is obtained (two trials under very nearly the same conditions pooled against each other).

The change in experimental conditions and the differential changes in the individuals are reflected in the intercorrelation of sittings which is presented in Table VII.

TABLE VII

Intercorrelation of Sittings of Steadiness Test. Six Trials per Sitting, Two Day Intervals (N = 80)

SITTING NO.	1	2	3	4	5	6	7	8	9	10
1		.80	.65	.65	.64	.61	.67	.59	.53	.63
2	.80		.88	.75	.71	.62	.72	.64	.66	.69
3	.65	.88		.76	.73	.68	.76	.64	.61	.70
4	.65	.75	.76		.85	.72	.77	.72	.72	.77
5	.64	.71	.73	.85		.81	.81	.78	.79	.87
6	.61	.62	.68	.72	.81		.85	.83	.73	.76
7	.67	.72	.76	.77	.81	.85		.79	.73	.83
8	.59	.64	.64	.72	.78	.83	.79		.87	.78
9	.53	.66	.61	.72	.79	.73	.73	.87		.77
10	.63	.69	.70	.77	.87	.76	.83	.78	.77	

Inspection of this table shows that those sittings that are separated by the greater amount of time are less related than those which are consecutive. The exact amounts of decrease

in the average of the correlation for the sittings separated by a varying number of sittings is shown in Table VIII.

TABLE VIII

Effect of Time Interval and Practice on the Correlation of Sittings (Drill Group, N = 80)

Sittings Interpolated	0	1	2	3	4	5	6	7	8
Av. of r's	.82	.75	.73	.72	.71	.67	.65	.61	.62

This table is very similar to the one for trials (Table II of previous study) and the same consistent decrease is evident although the effect must be attributed to two causes (time interval and practice) whereas practice did not affect the intercorrelation for trials.

It is interesting to note the effect of the motivation introduced at the tenth sitting. The experimenter thought that the addition of competition on the last sitting would tend to reintroduce some of the emotional element into the situation and therefore make the last sitting have more in common with the first few sittings than the next to the last one. Table VI presented evidence to show that the average performance was considerably disturbed by the element of competition and the intercorrelation table shows the increased relationship of the tenth sitting with the first sitting over that of sitting 9 *vs.* sitting 1. The same relation holds when sitting two and three are included in the comparison with nine and ten and one is probably justified in concluding that the dropping out of the emotional element is a considerable factor in both the practice effect and in the differential changes in the performance of the individuals which is reflected in the intercorrelation table.

SPEARMAN-BROWN PREDICTIONS FOR REPEATED SITTINGS

The presence of systematic changes in the scores of the individuals as the sittings progress make it improbable that the Spearman-Brown formula may be applied without taking into

account the effect of the time interval. If this is the case, then we will not be able to state the added consistency that will accrue because of the increased number of sittings unless we confine the predictions to the time interval upon which the unitary r is based, and unless the unitary r is based upon a uniform time interval instead of on the average of all of the intercorrelations. When we make our predictions in that manner the following table results:

TABLE IX

Empirical Results versus Spearman-Brown Predictions for Odd versus Even Sittings ($N = 80$)

SITTINGS CUMULATED	PREDICTED RESULTS	EMPIRICAL RESULTS
Unitary r	$.821 \pm .024$	$.821 \pm .024$
1, 3 *vs.* 2, 4		.873
2, 4 " 3, 5		.921
3, 5 " 4, 6		.904
4, 6 " 5, 7		.924
5, 7 " 6,8		.866
6, 8 " 7, 9		.917
7, 9 " 8, 10		.922
Average 2 *vs.* 2 r's	$.902 \pm .015$	.904
1, 3, 5 *vs.* 2, 4, 6		.942
2, 4, 6 " 3, 5, 7		.953
3, 5, 7 " 4, 6, 8		.924
4, 6, 8 " 5, 7, 9		.941
5, 7, 9 " 6, 8, 10		.944
Average 3 *vs.* 3 r's	$.932 \pm .011$	.941
1, 3, 5, 7 *vs.* 2, 4, 6, 8		.945
2, 4, 6, 8 " 3, 5, 7, 9		.957
3, 5, 7, 9 " 4, 6, 8, 10		.948
Average 4 *vs.* 4 r's	$.948 \pm .009$	.949
1, 3, 5, 7, 9 *vs.* 2, 4, 6, 8, 10		.961
Value of 5 *vs.* 5 r	$.958 \pm .007$	.961
1, 2, 3, 4, 5 *vs.* 6, 7, 8, 9, 10		.852

Inspection of this table shows that the predictions and the empirical results agree very well when the time interval is maintained constant. The P.E.'s are the limits for the indi-

vidual correlations and not for the average values which they are opposite. In making the detailed comparison of the individual correlations with the predicted values, we note that of the 2 *vs.* 2 *r*'s only two of the seven are within the limits of the P.E. of the predicted value even though the average value is only .002 from the predicted one. The remainder of the individual *r*'s agree so well with the predicted values that, of the sixteen possible comparisons, nine are within the limits of the P.E.'s of the predicted *r*'s.

The fact that differential changes are involved in the levels of performance for the different individuals as the sittings progress is again shown by the fact that the correlation of the first five and the last five sittings is only .85. On the basis of the reliability of five sittings as against one, the reliability predicted for that cumulation was .96. One might have expected that reliability had we not shown previously that the performance on the successive sittings shows a considerable practice effect when the repetitions of the test are spaced by one day intervals only. With the introduction of a longer time interval between the successive sittings, the element of adaptation to the test and testing situation might have been eliminated so that the successive tests of the individual's ability might have been considered as random samples. If such conditions were fulfilled and steadiness could be considered as having no constant direction of change for the individuals tested, the predicted reliability on the basis of two successive records would be an accurate statement of the reliability to be expected for any length of test considered. The preceding analysis of the data secured from various measurements of steadiness have shown such ideal conditions of measurement to be quite imperfectly fulfilled, since it seems that steadiness can not be assumed to be constant nor can the testings be spaced to eliminate the practice effect. Under such conditions it is important that the predictions by means of the Spearman-Brown formula be limited to the time interval involved in the determining of the unitary *r*.

SUMMARY OF EXPERIMENTAL DATA

There is a very marked practice effect on both the means and the standard deviations of the repeated sittings. One of the factors contributing to this practice effect is the adaptation to the test situation since an introduction of an emotional set in the individuals on the last trial disturbs their performance markedly.

The same discrepancy between the test-retest reliability and the odd-even reliability is evident for all of the sittings. The internal consistency of the single sittings does not change with the reduction in the means and the sigmas but is relatively constant for all of the sittings ($r = .96$). This value may be contrasted with the test-retest reliability of about .82 which is the average value for the correlation of consecutive sittings.

The reliability of the sittings increases according to the Spearman-Brown formula in case they are cumulated by the odd-even method.

The reliability of the sittings *does not* increase according to the Spearman-Brown formula in case the time interval for the cumulations and for the unitary r is not constant.

The presence of systematic changes in the repeated sittings makes the procedure outlined for securing a very consistent index of steadiness very laborious since reliability does not increase according to the Spearman-Brown formula.

Steadiness cannot be considered a static function and no single measure or group of measures occupying a short space of time may be considered to represent more than a fair index of the ability of the subjects.

THE MEASUREMENT OF DYNAMIC FUNCTIONS—AN INDEX OF TRAIT VARIABILITY

Most of the measures of psychological traits imply that the function measured is static. The errors of measurement due to such factors as fatigue, shifts of attention, emotional set or attitude, physiological and other factors are considered to be perfectly random in their operation or non-operative. However, these factors are of such nature that they tend to

persist during a certain period of measurement and since their effects may be absent in measures secured at another time, they may be considered as constant errors for a given sitting. The presence of such constant errors at a particular sitting would make it impossible to secure a measure of a trait at one particular time which would necessarily characterize the individual over a longer period. Any trait which behaves in this fashion may be termed dynamic and if there were no changes of constant direction in the trait as repeated samples were made, high reliability could be obtained by a series of measurements secured at different times. This procedure would convert constant errors present only at particular times into variable errors over a period of time.

The above mentioned factors may not be operative for some measurements and considerable work in mental measurement has demonstrated the relative constancy of the IQ. Of course, lack of perfect consistency is to be expected for any psychological function, but the errors of measurement of intelligence are largely attributed to errors of the measuring instrument such as lack of homogeneity and length of test. The fact that differences in IQ's at different testings show only a slight tendency to increase as the length of time between the testings is increased has been the evidence which supports the majority opinion with regard to the constancy of the IQ, *i.e.*, errors in the measuring instrument account for practically all of the observed fluctuations.

In measuring a static trait under ideal conditions, it would be possible to secure a perfectly reliable index of the individual's ability by merely increasing the length of the test at a single sitting or by splitting up the necessary number of trials into several or many sittings. There would be no difference in the results achieved by the two procedures if the individual's ability were assumed to be constant. It is perfectly obvious, however, that if an individual's ability should be perfectly measured at one time and subsequently some factor conditioning it should be temporarily or permanently altered, our theory of measurement would no longer be ade-

quate. Perfect consistency of the function measured is implied in practically all psychological measurements and many text books of statistics have a statement to the effect that there is theoretically no difference as far as added reliability is concerned whether the test is doubled in length or whether two different applications of the standard length test are made. Psychologists have not taken the word "theoretically" into account and have proceeded to apply statistical techniques to data where the constancy of the trait has not been proven.

The fact that intelligence has been found to be approximately static and independent of changes operating over a relatively long period of time has led to the assumption that the same statistical techniques may be applied to other psychological functions without an examination of the constancy of the particular trait. However, the preceding data have shown what is to be expected when such assumptions are uncritically made in measuring motor control or steadiness. Predictions as to increased reliability as a result of lengthening the test were found to be greatly in error and correction of observed relationships for attenuation on the basis of the reliabilities reported would lead to an underestimation of the true correlations between the abilities measured. This underestimation is due to the fact that reliabilities reported were too high, in which case the correction for attenuation does not increase the existing relationships by a sufficient amount. It is apparent that the degree to which a trait is static or dynamic is very important for our manipulation of test results and for our interpretation of the relationships discovered.

No single quantitative statement exists for the purpose of characterizing a measured function with reference to its degree of variability or consistency. The consistency of the particular function under consideration is dependent not only upon the variability inherent in the trait but also upon the degree to which the errors of observation have been eliminated (Lengthening the test, etc.). If we could correct all test-retest reliability coefficients on the basis of the odd-even r, then they would be reduced to a common basis of comparison. A

method for such correction which relates odd-even and test-retest coefficients was outlined in a previous article. There we demonstrated that this correction was empirically justified for test material which is as homogeneous as repeated test trials. It will be remembered that test-retest reliability was corrected for attenuation on the basis of the internal consistency of the single sitting and that the correction for perfect internal consistency merely reduces to the ratio of the test-retest r and the odd-even r, *i.e.*, the maximum relationship to be expected from a test *vs.* retest r for a particular trait $= \frac{\text{test-retest } r}{\text{odd-even } r}$. Thus if the odd-even reliability of a test were .50 and the test-retest r were .40, the maximum relationship to be expected between any two sittings for the trait would be .80, $\left(\frac{.40}{.50}\right)$. One would be justified in increasing the odd-even reliability in the above sample, but if the odd-even r had been .95 instead of .50 the maximum relationship to be expected would be only .42. This is an increase in the test-retest r of only .02 and represents the fruits of an increase in the test length up to an infinite number of trials per sitting. If both the test-retest and the odd-even r were equal then the correction would bring the relationship up to 1.00 and it would be theoretically possible to secure a perfectly consistent index of the trait by merely extending the length of the test at a single sitting.

The more practical use of the formula is in connection with increases of the internal consistency where the odd-even r is not increased to 1.00 but to some intermediate value. In that case the correction is given by the proportion: test-retest r: odd-even r:: X (corrected test-retest r) : proposed odd-even r. If the odd-even r of the previous example were increased from .50 to .80 then we might expect an increase in the test-retest r to .64. This increase in the odd-even reliability coefficient could be attained by an increase of the test by four times its present length. If the test having an odd-even reliability of .95 and a test-retest reliability of only .40 were increased by

four times the original length, the test-retest reliability would only be increased to .41 and certainly that increase (.01) in the test-retest r would not justify the additional labor involved in such a testing program. Under these conditions it would be advisable to increase the number of sittings, since the test-retest reliability coefficient should increase according to the Spearman-Brown formula, and a repetition of the test at four different sittings should increase the reliability to .73. The preceding examples have demonstrated that the calculation of these "corrected" test-retest coefficients furnishes definite information which may serve as a basis of a program for securing very reliable measures of the individuals tested.

It is proposed that this "corrected" test-retest coefficient be termed Coefficient of Trait Variability. This new index indicates the degree to which dynamic changes in individuals reduce the correlation from the perfect correlation (1.00) which might be expected if errors of observation were entirely eliminated. It is the observed test-retest reliability coefficient corrected for the errors of measurement and represents the correlation to be expected if the measures of the two sittings correlated are perfect. As was stated previously, the identity of the odd-even and the test-retest correlations would reveal that the trait measured is a static one since the correlation of the results of perfect measurement at each of two sittings would be 1.00. However, any discrepancy in the odd-even and the test-retest correlations indicates the presence of variability in the individuals tested and the Coefficient of Trait Variability states the maximum correlation to be expected from two different sittings even if each of the sittings has perfect internal consistency.

SUMMARY AND CONCLUSIONS

The present investigation was undertaken to ascertain the reasons why the steadiness test, which had been used in the Minnesota Mechanical Ability Research Project, did not increase in reliability (test-retest) as the number of trials (in different holes) was cumulated. The main result is the dis-

covery that the test was not at fault but that the individual's ability changed from time to time as a result of factors constant for a particular sitting but variable from sitting to sitting. In other words, trait variability and not errors of measurement are involved. Therefore, increase in the length of the steadiness test *at a particular sitting* merely serves to emphasize errors constant for that sitting instead of eliminating them. Hence the Spearman-Brown formula based on odd-even reliability coefficients is not applicable with reference to test-retest reliability. As a result the correlation between two different sittings will not increase as predicted.

Coefficients of Trait Variability if computed for various traits would probably show a great range and one would probably find steadiness to be quite variable in comparison with intelligence, since the latter has been shown to be relatively constant. The present research study has shown steadiness to be so variable that the maximum relationship which one could expect to find between two sittings, each of infinite length, would be about +.80. On the other hand, the test-retest reliability coefficients for measurements of intelligence are actually much higher and hence the Coefficient of Trait Variability for that function would probably be somewhere in the range from .90 to .98. Similarly, the determination of Coefficients of Trait Variability for the entire range of psychological (physiological and growth functions also) functions would add materially to our present meagre knowledge regarding trait variability in the individual.

In recognizing that many psychological traits are dynamic (those for which we cannot secure a characteristic index at one sitting), we may seem to have played into the hands of those critics of experimental psychology who insist that mental processes in individuals are so changeable that they cannot be accurately measured. We have admitted the variability of traits within the individual but we have not been content to rest with that statement. We have offered a quantitative index of trait variability and on the basis of that index have suggested a means for increasing the reliability of the mea-

surement of a dynamic function. Essentially, the suggested procedure emphasizes the importance of increasing the number of sittings rather than perfecting measurements within a single sitting.

If the constant errors present at each sitting behave in a random manner when the sittings are repeated, the reliability of the measurement of a dynamic function may be increased by merely increasing the number of sittings. The reliability for a series of sittings should theoretically increase according to the predictions made by the Spearman-Brown formula and, therefore, the added reliability secured by this method should increase rapidly. Unfortunately, the complete verification of the Spearman-Brown formula for this procedure with the steadiness test could not be expected because the sittings were secured at such short intervals that the combined effect of practice and adaptation was considerable. However, the procedure was theoretically justified since the empirical reliability coefficients for odd-even sittings satisfied the Spearman-Brown predictions. In this manner we have shown that many tests which might be abandoned as hopeless, judged from the standpoint of test-retest reliability alone, can be justified if administered several different times.

The most important implication of this thesis for psychometric theory and practice is the increased emphasis which should be placed upon repeated examinations of individuals at different times rather than the completion of testing procedures within a given examination period. The thesis should also serve to clear up much of the obscurity and misunderstanding which has resulted from observed discrepancies between odd-even and test-retest reliability coefficients. Finally, there is the demonstration that the Spearman-Brown Prophecy Formula, although mathematically correct, is applicable only to data derived from the measurement of static traits.

A BRIEF STUDY OF THE VALIDITY OF A NEUROTIC INVENTORY

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NEUROTIC inventories have been frequently included in tests and questionnaires for the purpose of delineating those individuals whose personalities seem well adjusted from those whose personalities appear somewhat warped. Many of these inventories contain a number of different items which might be made up of activities, worries and traits commonly regarded as indicative of neuroticism. From the individual's response to all the items an attempt is made to assign to him a score indicating either that he is disturbed by many of the items or that few of them give him excessive worry.

The present study was not undertaken in an attempt to assign scores to the individuals taking the neurotic inventory herein described, nor was there any attempt to determine internal consistence. Instead, the purpose was roughly to discover whether the individuals and groups checking the inventory were doing so according to their true feeling toward the items.

The University of Buffalo Personnel Questionnaire for Students Entering College as revised by Edward S. Jones in 1931[1] contains, in addition to other detailed personnel data, a list of fifty short items collected from various sources, most of them from the Thurstone Neurotic Inventory.[2] The items adopted were those which seemed to be the most significant in terms of total score. Other items than those from the Thurstone list were arbitrarily selected from among the most com-

[1] Jones, Edward S. "Personnel Questionnaire for Students Entering College," C. H. Stoelting Co., Chicago. 1931 Edition.

[2] Thurstone, Thelma G., and L. L. "A Neurotic Inventory," *Journal of Social Psychology*, I, pp. 3–30.

mon and apparently indicative freely given "worry" factors found in past personnel questionnaires at the University of Buffalo. The final form of this fifty-item neurotic inventory was presented in the questionnaire in the following manner:

"Which of the following conditions affect you, and which are matters of worry to you? Check on the right in the appropriate column."

THINGS WHICH DISTURB ME	CONTINUOUS & FREQUENT ANXIETY	DISTURB ME MODERATELY	LITTLE OR NO WORRY
1. Poor health			
2. Fright and restlessness at night			
3. Getting tired easily			
4. Pains in some part of the body			
5. Fear of rats			
6. Unfair treatment by teachers			
7. Harboring intense dislikes of people			
8. Wanting to get even with some one			
9. Experiencing a sense of inferiority			
10. Being quite depressed when ignored			
11. Preferring recreation alone			
12. Mind wandering; losing track of things			
13. Being a crank about food			
14. Getting bored with amusements easily			
15. Experiencing swift changes of interest			
16. Being moody			
17. "Day-dreaming" while working			
18. Considering myself a nervous person			
19. Giving way to tantrums			
20. Having a desire to be destructive			
21. Shyness			
22. Having a poor appetite			
23. Things swimming before my eyes			
24. Dizziness while doing things			
25. Unpleasant feelings in my body			
26. Having my feelings easily hurt			
27. Headaches or pressures in the head			
28. Uneasiness in crossing a high bridge			
29. Fear of lightning			
30. Difficulty in making friends			
31. Getting rattled			
32. Never being asked to direct things			
33. Bothered by "k i d d i n g" from others			

THINGS WHICH DISTURB ME	CONTINUOUS & FREQUENT ANXIETY	DISTURB ME MODERATELY	LITTLE OR NO WORRY
34. Getting discouraged easily			
35. Losing my temper quickly			
36. Fidgeting			
37. Biting my fingernails			
38. Being "touchy" on various subjects			
39. Difficulty in concentrating			
40. Often depressed and in low spirits			
41. Quick shifts in moods without reason			
42. Getting upset easily			
43. Just feeling miserable			
44. Afraid of contracting certain diseases			
45. Slow to forget unpleasant experiences			
46. Unable to stand the sight of blood			
47. Being troubled by sleeplessness			
48. No enthusiasm about life's possibilities			
49. Worrying about little things			
50. Suspecting people of underhanded motives			

For the purposes of this study one hundred eighty-seven men were selected at random from the entering classes of the College of Arts and Sciences and the School of Business Administration. No attention was paid to their secondary school training or standings. Their psychological test results were not used or noted. As each entering student fills out the whole questionnaire during the same week he encounters the various psychological and scholastic tests at the University of Buffalo, there was a tendency for fairly good morale and rapport.

According to observations (friends, family and personnel workers) and interviews, the one hundred eighty-seven male students in this study were divided into two main groups. A fairly large group of one hundred forty-six men were found to be quite well adjusted, having no obvious tics, no unusual shyness or introversion, no extreme evidence of extroversion, very slight or no sexual maladjustment and few, if any, real worries. A smaller group of forty-one students was found

to be neurotically disturbed, and might be classified under the following headings for lack of final information concerning them: obvious speech difficulties (8); fears, worries, pains associated with illnesses or physical injuries (4); upset through financial, family and companionship worries (12); excessive timidity and introversion (10); sexual fears and worries (7).

The results of the neurotic inventory section of the personnel questionnaire showed that out of a total of nine thousand three hundred fifty possible checks for both groups, approximately eighty-six per cent, or eight thousand forty-one of the responses, were checked in the "little or no worry" column. Twelve per cent, or one thousand thirteen responses, were checked in the "disturb me moderately" column, and only one per cent, or eighty-three responses, were checked in the space allowed for "continuous and frequent anxiety." (See Table I.)

Not only did the entire group seem to check this inventory in a way which made them appear fairly well adjusted, but there were only fifteen individuals out of the total number of one hundred eighty-seven who checked more than two items in the "continuous and frequent anxiety" column. These fifteen individuals account for a large proportion of the one per cent of the responses in this column. Of the fifteen only three really belonged in the neurotic group, having some real feeling about the items checked. The others at a later date indicated that they had checked items in the manner mentioned "because they felt that they *should* check" a number of items in other than the "little or no worry column." Others indicated surprise at the items they had checked and proceeded to demonstrate fears and worries about entirely different items. Even among the three who did place themselves correctly within the neurotic group there appeared to be some definite evidence of an attempt to "cover up" by not checking items which gave them concern in the most positive column.

This large group, when split into its two smaller parts by the process previously outlined, showed no unusual or unique

tendencies in either section which might indicate the effectiveness of the neurotic inventory as an instrument effective in pointing out neurotic individuals. Table I gives the figures and percentages separately for the two groups and for the total group. The similarity of the responses of the two groups seems to indicate that the people, neurotic or well adjusted, who fill out this neurotic inventory appear to be undifferentiated when surveyed as groups.

TABLE I

GROUPS	KNOWN NEUROTICS (41)		ADJUSTED (146)		BOTH GROUPS (187)	
	Items checked	Per cent	Items	Per cent	Items	Per cent
1. Continuous & Frequent Anxiety	24.6	1.2	58.4	0.8	83.0	1.0
2. Disturb Me Moderately	291.1	14.2	722.7	9.8	1,013.8	12.0
3. Little or no Worry	1,734.3	84.6	6,518.9	89.3	8,253.2	86.95
Totals	2,049.9	100.0	7,300.0	100.0	9,350.0	99.95

A brief glance at the responses per person reveals a tendency for each of the two groups to report similarly; that is, for the two groups to have the same general median number of responses. The median number of responses for each group on the "continuous and frequent anxiety" column was between zero and one, the median number of responses on the "disturbs me moderately" column was between three and four for each of the groups, and that on the "little or no worry" section was 42.3 for the neurotic group and 44.65 for the adjusted group. The range of responses was very much alike for both groups. One individual in the neurotic group did respond with what seemed later to be a complete worry "picture" of himself by checking over fifteen items in the "continuous and frequent anxiety" column. With this exception the common top number for each group in either of the two "worry" sections was fifteen checks.

A few of the individual cases show the lack of delineation along expected lines in the use of this neurotic inventory.

C. filled out the inventory, checking only two items in the "disturbs me moderately" column. All the rest of his checks were in the "little or no worry" section. The two checks were correct as far as they went; they were concerned with "shyness" and "difficulty in making friends." These were checked as moderately disturbing factors, yet the boy had very definite and constant fears or worries about these and at least twenty other items in the inventory. This boy eventually had to be sent home because his delusions of persecution developed alarmingly.

W., in filling out the inventory, indicated that there were thirteen items which were a source of moderate disturbance to him and that there were three items which he felt bothered him continuously. Yet this individual must have been passing through some experience which affected him only at the time of filling out the inventory; later he was to all appearances and according to his own reports in repeated interviews not worried about any of the items he checked.

N. checked five items as being continuously bothersome for him and four as being moderately disturbing, yet he had no real feeling concerning the items he checked and later investigation showed no worry or fear about them.

K. checked only one item in the "moderate worry" section, yet was undeniably neurotic as shown not only in an objectively noted tic, his social difficulties, and his morbid feelings and family history, but also in his discussion of fears, in which he inadvertently voiced many of the very things he failed to check on the inventory.

Although the cases noted are but samples and are possibly more extreme than the ordinary there appears to run through the general group an error in checking its worries when there is an attempt made to play the items off against some factor external to the neurotic inventory. The inefficiency thus roughly illustrated of the neurotic inventory to distinguish between neurotics and the well adjusted may be due to a number of influences. One, the atmosphere in which the inventory was filled out was similar to a test situation and the students

wished to do the thing that was most desirable. Consequently they tended to approximate the type of answer which would lead the authorities to believe that each one of them was an excellent person. Other influences may be: two, the possible tendency to cover up by some who might fear the results of revealing their innermost worries on paper; three, the possibility that some of the students might not recognize their worries or fears on paper; four, the part that positive or negative suggestions may play (either in the wording of the questionnaire or spoken directions); five, the fact that despite the use of high scoring items in the adaptation the shortness of the questionnaire may make it inefficient in "catching" the unadjusted; and six, the part that may be played by the users of such questionnaires in overlooking series of personality-building events possibly not open to discovery through an arbitrarily-derived series of questions.

The failure of the present list to act as an efficient delineator between the neurotic individuals and the fairly well adjusted college freshmen raises the question as to how effective, generally, this method may be.

Some studies using much longer and more detailed question forms, namely, the "Woodworth Psychoneurotic Inventory" and the "Thurstone Neurotic Inventory," or in shorter form the many derivatives of these two, have shown some valid differences between neurotics and well adjusted people. However, among the various studies one finds two principal methods employed. One method employs association between items as a means of discovering its validity. Thus in the Thurstone Neurotic Inventory 233 items were found to be positively associated, consequently the authors feel that validity has been satisfactorily proven by this internal consistency. The second method utilized is to attempt to correlate teachers' ratings, clinicians' ratings, or ratings by others. Among other more common methods is that of comparing the scores achieved by institutionalized individuals with those of some adjustment.

If the present questionnaire is at all comparable to the Thurstone Neurotic Inventory the local results might tend to

give rise to some questions concerning the adequacy of the first method mentioned above. In addition, Allport and Vernon[3] point out a definite fault in the internal consistency method; in making a testing situation out of the inventory a constant halo error is produced in the single item, thus making the interagreement of items to some extent false. They suggest that it would be more desirable to weigh the qualities to be employed by various techniques, using the ones that intercorrelate satisfactorily.

The second method, possibly better than the first unless all kinds of information are available on the population to be tested, does not appear to yield any very stable results. Among the best validational correlation coefficients are those of Mathews,[4] who found correlations of .515 and .663 between scores on a revised Woodworth Neurotic Inventory and judgments by teachers of nervous stability. At the other extreme, Flemming and Flemming[5] report correlations of −.1481 and −.1392 (with age partialed out) between scores on the Woodworth questionnaire and teachers' ratings. Between these two lie coefficients of correlation of all values, the majority of them fairly low. The two workers last mentioned are led to feel that the Mathew revision of the Woodworth list is not a valid test. With such variation in reports, it appears that the method is a poor one, or that the type of test used is not valid.

The other common method of validating the test—that is, to compare the scores made by an adjusted group with those made by a group of obviously maladjusted people—seems to result in a fairly distinct delineation between the two groups, which in itself is a validation of the test used. But here the question arises as to whether the completely psychoneurotic personality is capable of answering any set of questions, re-

[3] Allport, Floyd, and Vernon, L. N. "Field of Personality," *Psychological Bulletin*, 27, pp. 677–730 (1930).

[4] Mathews, E. "A Study of Emotional Stability of Children," *Journal of Delinquency*, 8: 1–40 (1923).

[5] Flemming, E. G., and Flemming, C. W. "Validity of the Mathews Revision of the Woodworth Personal Data Questionnaire," *Journal of Abnormal & Social Psychology*, 29, 1928–9. Pp. 500–506.

gardless of kind, as would a normal adjusted person. However, the local use of a short form of a revision taken principally from the Thurstone Neurotic Inventory seems to show little or no differentiation between a poorly adjusted group of freshman and a fairly well adjusted group, when factors other than scores are considered.

However rough the technique employed herein may be in failing to follow a stiff statistical approach and not establishing internal consistency as a measure of validity, it is a definite attempt to find some external check with an inventory whose item scores are quite high.

The failure of the local adaptation from Thurstone to act as an adjustment delineator has been productive of scepticism in the writer as to the value of this instrument. Its validity undoubtedly has been much better at other institutions, but locally it is of negligible value because it does not point out, even crudely, those individuals who need the most attention.

Possibly this or a similar type could be given in a manner which would combine the interview with a written report by the individual. Later the items could be checked by observations and repeated rapport-gaining interviews. This would be a time-consuming and expensive project, but might yield valuable results for the construction of a more final adjustment questionnaire, or as a method of validation for a questionnaire.

As it appears at present, the attempt to make a mechanical pencil-and-paper instrument for "spotting" the non-adjusted personality is a shaky proposition. The problem of neuroticism presents many snags to the research worker who desires to assign arbitrary scores to an item which can be only a minute portion of a total experiential system. The personality of any person is so entirely individual that the task of creating a single instrument for its measurement, although commendable, is probably a dubious one.

A COMPARISON OF SPANISH-SPEAKING AND ENGLISH-SPEAKING CHILDREN IN READING AND ARITHMETIC

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IN many communities of Texas, particularly along the Mexican border, local school problems are complicated by the presence of a large number of children chiefly of Mexican descent whose home language is Spanish. According to prevailing methods of instruction in the public schools, they are instructed almost wholly in English, and are given no introduction to the written forms of their native language until they reach the high school. This almost complete dependence upon a foreign language from the beginning of their school work places a special burden on the elementary grades and raises certain serious questions regarding the effect of this treatment upon their school progress and even their mental growth.

Additional problems arise from the low economic and cultural level of large numbers. Probably more than half of the Spanish-speaking population of Texas belong to the unskilled-labor group and among these the wages are often distressingly low. Among the poorest, extremely unfavorable cultural conditions prevail.

It is the purpose of this paper to compare a group of Spanish-speaking school children and a group of English-speaking school children with special reference to ability in reading and arithmetic, the two subjects which perhaps more than any others determine progress through the elementary grades. The purpose is not only to reveal differences in the two groups but also to add to that accumulating body of scientific data which must be gathered before the abilities and difficulties of Spanish-speaking children are fully understood.

The original material was obtained in a cooperative project carried on by superintendents, principals, and teachers of the Lower Rio Grande Valley of Texas in collaboration with the writer.[1] The testing program consisted of a series of tests in the fall, then an interim of four or five months, and finally a series of tests in the spring. The results presented here are based upon Form V of the New Stanford Reading and Arithmetic Tests in the fall and Form W of the same tests in the spring. In some of the cooperating schools the tests were given in grades 2 to 8, and in others in a more restricted range of grades. Some of the schools which reported results for the fall series did not submit reports for the spring series. While it was intended to test all Spanish-speaking and English-speaking children in the several grades, this program was not fully carried out.

Results of the tests were reported to the writer on individual cards, which carried supplementary information on age, sex, grade, occupational level of parents, and the like. Tabulations were made by means of a Hollerith machine. The results of the fall tests were first tabulated, and then a separate tabulation was made of the cards which carried information for both the fall and spring tests.

THE FALL TESTS

The results of the fall tests were tabulated by grades and by ages. In the grade tabulation all available cards were used, but in the age tabulation only the cards were used which came from systems in which the tests were given in all the grades 2 to 8 inclusive and to some at least of both

[1] Mr. F. C. McConnell was chairman of the special committee representing the schools. Grateful acknowledgment is made to the superintendents, principals, and teachers of the cooperating systems—Lyford, Rangerville, San Isidro, Roma, Sharyland, Pharr-San Juan-Alamo, Weslaco, San Benito, Mercedes, La Feria, Edinburg, and Santa Maria—for their work in supplying the original data; to Miss Christine Ellis and others for assistance in tabulation and computation; and to the Fund for Research in the Social Sciences, of the University of Texas, for financial assistance.

the Spanish-speaking and the English-speaking pupils. The number of pupils is not constant through all of the tabulations on account of the incompleteness of the reports or errors in tabulation. To save space the actual number will not be given in each tabulation of ages or grades. The number tested in the New Stanford Arithmetic Test corresponds fairly closely to the number tested in the New Stanford Reading Test, which number is given in Table 1. The sharp decrease in the number of Spanish-speaking children with advance in grade and the increase with advance in age reflect the retardation of these pupils.

TABLE I

Number of Pupils in New Stanford Reading Test Totals[1]

Grade	*Spanish*	*English*
2	209	352
3	186	368
4	143	324
5	90	324
6	78	353
7	110	411
8	28	221
Total	844	2,353

Age	*Spanish*	*English*
8	21	237
9	50	235
10	83	237
11	76	212
12	106	243
Total	336	1,164

[1] In the tabulation by grades only low sections are reported. One school was represented in the fifth and seventh grades only.

A tabulation of ages by grades, including a somewhat larger number of pupils than those listed in Table 1, shows

that the Spanish-speaking pupils grade for grade are from 1.6 years to 2.9 years older than the English-speaking pupils, that in general the difference in ages decreases with advance in grade, and that the ages of the Spanish-speaking pupils are the more variable.

Texas has an eleven-year system of elementary and secondary schools, while most states have twelve. The author's grade norms are in terms of the twelve-year system. Table 2 has been compiled to give not only a comparison of Spanish-speaking and English-speaking children but also a comparison with the norms. The first column indicates the approximate grade placement of the pupils at the time of the test. The second shows the grade standing in a twelve-year system equivalent to this grade placement, on the assumption that each successive year represents a gain of one-eleventh of a year over the preceding. For example, on this assumption, the Texas pupil who is actually in grade 5.2 (end of second month of fifth grade) should have a grade achievement of 5.6 (the achievement of a twelve-grade pupil at the end of the sixth month of the fifth grade).

TABLE II

Achievement in Reading and Arithmetic in Terms of Grade Norms

SCHOOL[1] GRADE	EQUIVALENT NORM IN TWELVE-YEAR SYSTEM	ACHIEVEMENT OF PUPILS IN TERMS OF GRADE SCORE OF TWELVE-YEAR SYSTEM			
		Reading		Arithmetic	
		Spanish	English	Spanish	English
2.2	2.3	2.6	2.5	3.1	2.8
3.2	3.4	3.1	3.7	3.7	3.5
4.2	4.5	3.6	4.6	4.4	4.3
5.2	5.6	4.6	5.6	5.0	5.2
6.2	6.7	4.9	6.2	6.3	6.2
7.2	7.7	5.3	7.2	7.0	7.4
8.2	8.8	5.9	8.2	7.0	8.4

[1] The decimal indicates approximate months; for example, 3.2 means the third grade at the close of two months.

It may be seen from Table 2 that the English-speaking children are above the norm in the lower grades both in read-

ing and arithmetic and in the upper grades are below in both. In the upper grades their achievement is about that which would be expected in grades bearing similar numbers in twelve-year systems. For some reason they lose their initial superiority.

The Spanish-speaking children are above the norm in the second grade in reading and in the second and third grades

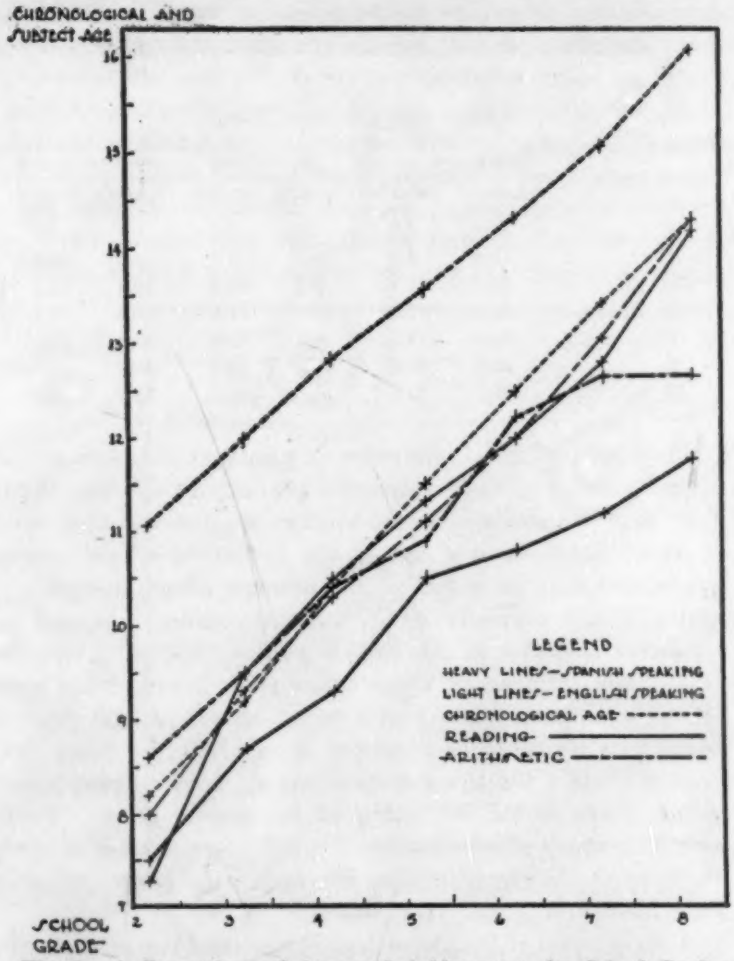

Fig. 1.—A Comparison of Ages and Achievements by School Grades.

in arithmetic, and are below in every other grade. They are above the English-speaking children in the second grade in reading and in grades 2, 3, 4, and 6, in arithmetic, but fall behind in the other grades. Their inferior standing in reading after the second grade is marked, averaging nearly a year in grades 2 to 7.

Table 3 and Figure 1 show the standing of pupils in the low sections of grades 2-8 in terms of "ages." High sections have been omitted because of the small number of cases.

TABLE III
Mean Ages and Mean Scores

GRADE	CHRONOLOGICAL AGE		READING AGE		ARITHMETIC AGE	
	Spanish	English	Spanish	English	Spanish	English
2	11.1	8.2	7.5	7.3	8.6	8.0
3	12.0	9.2	8.7	9.5	9.5	9.3
4	12.9	10.4	9.3	10.5	10.4	10.3
5	13.6	11.5	10.5	11.4	10.9	11.1
6	14.4	12.5	10.8	12.0	12.2	12.0
7	15.1	13.4	11.2	12.8	12.7	13.1
8	16.1	14.3	11.8	14.1	12.7	14.3

The ages in Table 3 are those of pupils at the close of one or two months in their respective grades. It appears, therefore, that in these schools the average English-speaking child is about eight years of age at the beginning of the second grade and that he gains on the average about one year in age with each successive grade. A little tendency toward retardation is shown in the middle grades. Since previous to 1930 many children in Texas below seven years of age were out of school, the age (eight) at which the second year is begun can probably be regarded as normal. In sharp contrast with this the Spanish-speaking children average about eleven years at the beginning of the second grade. Probably as a result of elimination, the difference in ages of these children in successive grades averages only about 0.8 of a year instead of a full year.

A comparison of the chronological ages and the subject ages is instructive. On the average the English-speaking children

fall a little short in both reading and arithmetic, but the average excess of chronological ages over subject ages is not very great (about three months). In the Spanish-speaking group, however, the discrepancy is much greater—about 3.6 years in reading and about 2.6 years in arithmetic.

It is interesting to observe that the average score of the Spanish-speaking children is greater than that of the English-speaking children in the second grade in both reading and arithmetic, greater also in the third, fourth, and sixth grades in arithmetic, but less in reading in every grade except the second. Both the reading and the arithmetic curves of the Spanish-speaking children cross those of the English-speaking children, but the reading curve falls much farther behind than does the arithmetic.

The fact that the Spanish-speaking children are on the average about a year lower in reading age than in arithmetic

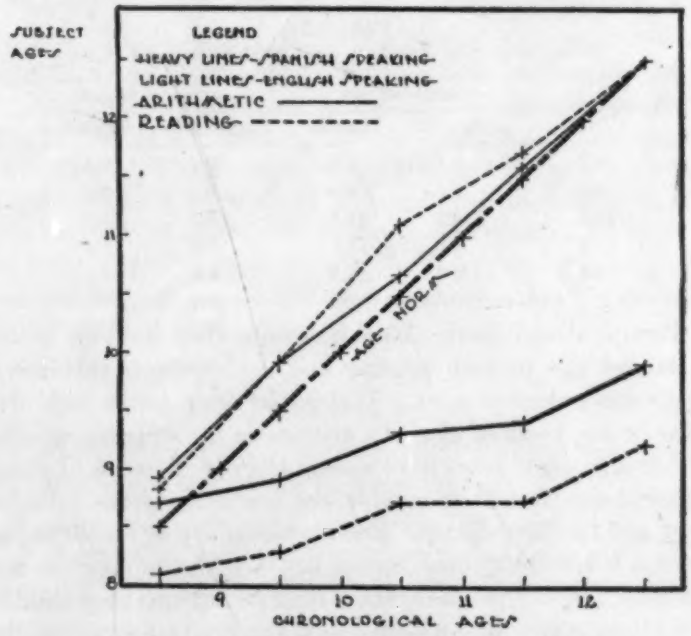

Fig. 2.—A Comparison of Achievements by Ages.

age is highly significant in its bearing upon the alleged language handicap of Spanish-speaking children. If reading and arithmetic may be regarded as tool subjects, these particular groups have clearly less ability in using the first of these tools than in using the second. Moreover, the history of their contact with language makes it much more reasonable to express this situation in terms of a handicap in reading than in terms of a special advantage in arithmetic. It is probable that arithmetic rather than reading more nearly represents their earlier potentialities. If the continued existence of a language handicap may be regarded as demonstrated, it is probable, in view of the close relation of language to thinking, that the handicap hinders growth in other fields as well, including arithmetic.

Table 4 and Figure 2 present the achievement of age groups eight to twelve in terms of subject ages.

TABLE IV

Mean Scores in Reading and Arithmetic — by Ages

CHRONOLOGICAL AGE	READING AGE		ARITHMETIC AGE	
	Spanish	English	Spanish	English
8.5	8.1	8.8	8.7	8.9
9.5	8.3	9.9	8.9	9.9
10.5	8.7	11.1	9.3	10.7
11.5	8.7	11.7	9.4	11.6
12.5	9.2	12.5	9.9	12.5

Except at age twelve the English-speaking children achieve a subject age in both reading and arithmetic in advance of their chronological ages. The initial lead grows less after nine or ten years of age. In arithmetic the Spanish-speaking children at eight years have a score slightly in excess of chronological age, but at successive age levels the score falls farther and farther behind . Their reading age at the eight-year level is below their chronological age, and the gap widens with advance in age. On the average the Spanish-speaking children are about a year and a half below the English-speaking children of the same age in arithmetic, and in reading a little over

two years below. On the whole the Spanish-speaking curves rise very slowly in the five years. This slow rise is probably the result *in part* of a retardation which comes from lack of early and continuous schooling. The fact that the reading curve lies below the other is additional evidence of a language handicap.

SEX DIFFERENCES

Of 910 Spanish-speaking pupils in the low sections of grades 2 to 8, classified as to sex, 483 (53%) were boys and 427 (47%) were girls; of 2,436 English-speaking pupils 1,256 (52%) were boys and 1,180 (48%) were girls. On the average the Spanish-speaking boys were, grade for grade, about three-tenths of a year older than the Spanish-speaking girls, and the English-speaking boys about one-fourth of a year older than the English-speaking girls.

The performance of 159 Spanish-speaking boys was compared with that of 177 Spanish-speaking girls scattered in age groups 8 to 12, and the performance of 591 English-speaking boys was compared with that of 573 English-speaking girls in similar age groups. In the Spanish-speaking group the score of the boys, when considered age by age, is on the average about one-fourth of a year lower than that of the girls in reading and about a tenth of a year above that of the girls in arithmetic. In the English-speaking group the boys are, age by age, on the average about a third of a year behind the girls in reading and about a sixth of a year behind in arithmetic.

OCCUPATIONAL GROUPS

Teachers were asked to classify the pupils on three levels according to the occupation of the parent:

(1) Owner-operator-professional group: farm owners, merchants, factory owners, public officials, architects, ministers, editors, physicians, educators, etc.
(2) Skilled-labor and tenant-farmer group: mechanics, bakers, carpenters, tailors, electricians, salesmen,

conductors, policemen, nurses, barbers, stenographers, etc.

(3) Unskilled-labor group.

This classification is only a rough one and is more or less difficult to apply. However, certain significant facts appear even when comparisons are made on this rough basis.

Of 889 Spanish-speaking children in grades 2 to 8, whose parents were thus classified, 165 (19%) were in the owner-operator-professional group, 215 (24%) in the skilled-labor and tenant-farmer group, and 509 (57%) in the unskilled-labor group; of 2,318 English-speaking children, 960 (41%), 888 (38%), and 470 (20%), respectively, were in the same groups. In other words the Spanish-speaking children come from a much lower socio-economic level than do the English-speaking children. As a matter of fact the figures quoted do not reveal the entire difference, for other observations lead to the belief that the average economic level of the Spanish-speaking children is much lower even within the same occupational classification. The extreme difference in socio-economic level of Spanish-speaking and English-speaking children is undoubtedly closely related to the age and ability differences already presented.

A grade-by-grade comparison of Spanish-speaking children (in the low sections of grades 2 to 7) by occupational groups shows that on the average the children of the owner-professional group are the youngest, the children of the skilled-labor and tenant-farmer group next older, and the children of the unskilled-labor group oldest. English-speaking children show the same trend.

A comparison of the differences of scores of occupational groups in reading and in arithmetic is shown in Table 5. The means are based upon comparisons of children of the same age groups.

It may be seen from Table 5 that with one exception in reading the trend is definitely for scores of the professional, skilled, and unskilled groups to rank in the order in which these groups are listed. For some reason which is not clear

TABLE V
Differences in Scores of Occupational Groups[1]

	READING		ARITHMETIC	
	Spanish	English	Spanish	English
Professional minus skilled	−.26	.26	.10	.24
Skilled minus unskilled	.46	.40	.42	.06
Professional minus unskilled	.20	.66	.52	.30

[1] The differences are means of the differences of means of age groups 8 to 12, inclusive.

the Spanish-speaking children of the professional group made a poorer showing in reading than did the Spanish-speaking children of the skilled labor group. In both Spanish-speaking and English-speaking groups, however, is found evidence of a positive relationship between socio-economic level and achievement in reading and arithmetic.

PUPILS HAVING BOTH FALL AND SPRING TESTS

As previously stated, some of the schools gave the tests both in the fall and four or five months later in the spring. The pupils whose records were complete for both tests were treated as a subgroup of the entire group tested in the fall and already discussed. In these tabulations, the subtests—paragraph meaning, word meaning, arithmetical reasoning, and arithmetical computation—were treated separately but no distinction of high and low sections was made. To save space in the following discussion detailed tabulations have been omitted and summaries only given.

In the order Spanish-speaking English-speaking, the numbers of pupils whose scores were used in this part of the study were, with slight variations in different tabulations: grades 2–8, 522 and 1,572; ages 8–12, 281 and 1,138.

In age the Mexican pupils are from 1.6 to 2.6 years older, grade by grade, with a mean difference of 2.1 years. The Mexican group is also the more variable (a difference of seven months in the inter-quartile range of the ages).

On the whole the Spanish-speaking pupils make scores about one-fourth of a year lower in paragraph meaning than in word meaning while there seems to be a very slight tendency for the English-speaking children to make higher scores in paragraph meaning than in word meaning. The greater facility of Spanish-speaking children with words rather than paragraphs is particularly noticeable in the first three grades in the fall tests.

In arithmetical reasoning and computation the Spanish-speaking children do about equally well when all grades are considered while the English-speaking children do slightly better in the reasoning. If the Spanish-speaking eighth grade (in which the number of pupils is small) were omitted, the difference in the scores of the Spanish-speaking children would slightly favor reasoning, as in the case of the English-speaking children.

The Spanish-speaking pupils in both age and grade comparisons make lower scores than the English-speaking pupils in the two reading tests, except in one case in the second grade. The differences are greater in the spring than in the fall. The average difference in reading in grades 2 to 7 is about a year; the average difference in age groups 8 to 12 is about two years.

On the average the Spanish-speaking pupils make lower scores than the English-speaking pupils in arithmetic, but the difference is much less in arithmetic than it is in reading. The average difference in the grade groups in arithmetic is 0.2 of a year, and this would be almost entirely wiped out if the eighth grade were omitted. The average difference in the age groups 8 to 12 is about 1.2 years.

THE GAIN FROM FALL TO SPRING

The gain in mean scores from fall to spring is probably in part a practice effect. Whether this affected the several groups in very different ways is unknown. The results show, however, that the Spanish-speaking children gained on the average less than the English-speaking children in reading and nearly as much as the English-speaking children in

arithmetic. In reading the mean difference in the gains of the Spanish-speaking and English-speaking children in the several grades is about 0.3 of a year; in arithmetic (grades 2 to 7 only) about 0.1 of a year.

On the whole there is less gain in reading in the middle grades than in the first two or three of the grades tested. The possible bearing of this fact upon methods of teaching and upon the policy of segregation of Spanish-speaking pupils is not clear from the data before us. In most of the systems for which results are included, the Spanish-speaking children (with a few individual exceptions) were taught in separate schools through the fifth grade, but the schools' methods and policies in reading are not known.

SUMMARY

The New Stanford Reading and Arithmetic Tests were given to Spanish-speaking (Mexican) children and English-speaking children in a number of schools of the Lower Rio Grande Valley in Texas. The following are some of the more significant facts from the fall tests:

(1) Grade for grade, the Spanish-speaking pupils are from 1.6 years to 2.9 years older than the English-speaking pupils.

(2) Both groups of children are above the grade norms in the second grade and below in grades above the fifth, thus losing their initial superiority.

(3) The average score of the Spanish-speaking children is greater than that of the English-speaking children in the second grade in both reading and arithmetic; greater also in the third, fourth, and sixth grades in arithmetic, but less in reading in every grade except the second.

(4) The Spanish-speaking children are on the average about a year lower in reading than in arithmetic. This condition is interpreted as evidence of a serious and persistent language handicap.

(5) A much larger percentage of Spanish-speaking than of English-speaking children have parents classified as unskilled laborers (57% and 20%, respectively). In both groups there

was evidence of a positive relationship between socio-economic level and achievement in reading and arithmetic.

In a study of pupils having both the fall and spring tests, the following facts appear:

(1) On the whole, the Spanish-speaking children make scores about one-fourth of a year lower in paragraph meaning than in word meaning. This greater facility with words than paragraphs is particularly noticeable in the fall tests in grades 2 to 4. The English-speaking children show a very slight tendency to make higher scores in paragraph meaning than in word meaning.

(2) If one grade in which the number was small is omitted, both groups are found to do slightly better in arithmetical reasoning than in arithmetical computation.

(3) Between the fall and the spring tests the Spanish-speaking children gain on the average less than the English-speaking children in reading but nearly as much as the English-speaking children in arithmetic.

(4) On the whole there is less gain in reading in the middle grades than in the first two or three of the grades tested.

(5) The variability of scores in both the Spanish-speaking and the English-speaking groups is large.

As a final summary, it may be said that this study has brought into sharp relief the average low achievement of Spanish-speaking children in American schools and has yielded important data on the language development of bilingual children. If our results are typical, there is no doubt that the average Spanish-speaking child suffers a serious and persistent language handicap at least as high as the eighth grade.

THE INFLUENCE OF FATHER'S OCCUPATION ON THE VOCATIONAL CHOICES OF HIGH SCHOOL BOYS[1]

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IN the Spring of 1932 the writers secured from the boys in four large Indianapolis high schools certain information relating to vocational choices. In addition to name, age, and grade they were asked to state their father's occupation, their own first, second, and third choice of occupation, reason for the first choice, and whether or not their fathers had attended college and whether they were planning to attend. The data relating to the relation between the fathers' occupations and the sons' choices are analyzed in this paper.

The four schools studied presented very different characteristics. They will be called Schools T, S, M and C. *School T* is the largest school in the city. It emphasizes prevocational or technical work. *School S* is the next in size in the city and of those studied. Its emphasis is placed on academic work. The boys come largely from the professional and business groups. *School M* is the third in size of those studied. It emphasizes prevocational and technical work. The boys come largely from the business, skilled and laboring groups. *School C* is the smallest of the schools studied. This is a Catholic high school and emphasizes academic work. The boys come mostly from the business and skilled groups. The detailed percentage distribution of the fathers' occupations are given in table 3.

Age grade distribution. In table 1 is shown the age-grade distribution of the subjects who returned questionnaires in each of the four schools. It will be seen that the age range

[1] Publications of Indiana University Psychological Clinics, Series II, No. 5. The complete data referred to are on file at the Clinic at Bloomington.

for three of the schools is from 12 to 21 years, while for School C the youngest pupils were 13 years of age. The average age for freshmen in each of the schools is 14 years and the increase is approximately one year per grade. The small number of postgraduates would suggest that it is a highly selected group, although the basis of selection is not evident.

TABLE 1
Age-grade distributions

SCHOOL	GRADE	AGE IN YEARS										AVER.
		12	13	14	15	16	17	18	19	20	21	
T	F	2	58	348	256	77	12	2	1			14.5
	S		1	65	319	196	46	6	5	1		15.5
	J			6	81	219	157	51	10	1		16.5
	S				5	41	125	112	31	16	1	17.5
	PG						15	16	18	7	1	18.3
S	F	2	44	163	63	14	3	2				14.2
	S		6	66	163	52	7	4				15.0
	J		1	6	63	132	69	20	11	2		16.2
	S			1	2	43	105	63	29	10	2	17.4
	PG					1	3	12	2			17.8
M	F	1	23	85	89	15	3					14.0
	S		3	15	78	46	15	5				15.4
	J			1	20	56	28	9	4			16.3
	S				4	18	59	36	5	3		17.2
	PG					1	10	4	4	1		17.7
C	F		3	34	43	6	1					14.6
	S			8	39	49	13	1				15.6
	J				5	41	62	17	3	1		16.8
	S					1	46	43	11	2	2	17.7

Of the total group of 4543 subjects 89.9 per cent expressed at least one choice as shown in table 2. By grade, which as shown in table 1 may also be considered by age, there is a constant increase from 87.6 per cent of freshmen to 96.7 per cent of postgraduates. The same increase holds for Schools M and C; while School S has a reversal between the junior and senior years, and School T between the freshman and sophomore and also between the junior and senior years. In no case of reversal is the difference in percentage very great.

TABLE 2
Percentage of subjects making a choice

CLASS \ SCHOOL	T	S	M	C	TOTAL
Freshman	88.6	84.7	90.7	80.4	87.6
Sophomore	87.5	88.6	91.3	92.7	89.0
Junior	89.1	93.7	93.2	95.3	91.5
Senior	88.7	91.4	95.2	99.0	92.0
Post-graduate	96.5	94.4	100.0	—	96.7
Total	88.5	89.8	92.6	92.5	89.8

The two larger schools, T and S, have the smaller per cent with choices, both being less than 90, while the two smaller schools, M and C, have percentages above 90. The type of work offered in the schools apparently does not affect the per cent expressing a choice because Schools T and M both stress vocational work, while Schools S and C offer primarily academic curricula.

OCCUPATIONAL DISTRIBUTION OF FATHERS

The occupations of the fathers and the boys' occupational choices are summarized in table 3. The grouping is approximately according to Taussig's scheme as used by Terman (Genetic Studies of Genius, vol. I), except that classes 4 and 5, "semi-skilled to slightly skilled" and "common labor," have been combined.

The total population of fathers shows slightly higher proportions drawn from the two higher occupational classes, a slightly smaller proportion from the skilled group, and less than one-half as many from the laboring group as are represented by the 1930 census figures for the city of Indianapolis. There are pronounced differences between the schools. School T, from which the largest number of subjects was secured, has approximately the same proportions as the census figures, with the exception of the laboring group in which the school has about one-half of the census percentage. School S has a very high proportion in the professional, semi-professional and business groups and a very small number in the skilled

TABLE 3

Distribution of fathers' occupations, sons' choices and census figures by major occupation groups

OCCUPATION	T		S		M		C		TOTAL		CENSUS
	F	S	F	S	F	S	F	S	F	S	
Professional	5.7	36.2	14.4	60.4	5.7	41.8	4.4	51.7	7.8	46.8	4.4
Semi-professional & Business	32.1	21.0	61.9	22.7	31.3	29.8	41.8	23.4	40.4	21.8	32.3
Skilled	33.9	29.5	11.2	5.9	29.3	19.8	36.0	16.7	27.6	19.9	33.6
Labor	13.9	1.9	3.1	.6	21.4	1.3	6.3	.7	11.4	1.3	29.8
Dead	5.0		6.5		4.4		6.0		5.4		
Unemployed	9.4		2.8		7.6		5.6		7.1		
No choice		11.5		10.4		7.4		7.5		10.1	

and laboring classes. School M, like School T, follows the census figures fairly well with only a slightly less percentage in the skilled and laboring groups. School C has the same proportion in the professional class, a very much lower proportion of the laboring class, and a higher percentage from the semi-professional and business groups.

It must be noted that the percentage figures for the census are calculated from tables giving numbers of males over 10 years of age gainfully employed, while those for the schools are on the basis of total number of subjects returning completed blanks. Therefore, we must call attention to the last two lines of the table, showing the numbers of fathers dead and unemployed. The per cent of fathers dead is fairly constant for the four schools, but we have no way of knowing what the occupations of these fathers were as the information was not asked for.

In considering the figures for unemployed it must be remembered that these data were secured in the Spring of 1932 which was a time of acute unemployment. A few cases were included under this heading which were reported as "retired." Schools T and M, which had the larger percentage in the laboring and skilled groups together, had the larger per cent unemployed. School C stood between these, and School S, which had a very low percentage in the lower groups had relatively little unemployment.

In this table also are shown the percentage of boys selecting occupations in the various classes. It is evident that neither the father's occupation nor the needs of the community are reflected in their choices. Nearly half of the total group chose the professions while of the fathers only 7.8 per cent are so engaged and the population of Indianapolis includes only 4.4 per cent so employed. At the opposite extreme 11.4 per cent of the fathers are grouped as laborers; of the gainfully employed in the city 29.7 per cent are so grouped, but only 1.3 per cent of the boys selected these occupations. While, of course, most of such unskilled places will be filled by people who have not attended high school,

still these pupils will come nowhere near replacing their own fathers if they are able to carry out their wishes.

There appears to be a slight relation between the schools and choices. A larger percentage of boys in vocational School T select skilled trades than in the other schools. Also academic schools C and S have higher percentages choosing professions.

These gross figures, as suggested above, indicate a very small relationship between the fathers' occupations and sons' choices. If, however, the data are treated by grades, would there be a significant change? Or even though a boy does not select his father's occupation on his first choice, is he apt to do so on his second or third? Further, if instead of comparing percentages we should match each boy's choice against his own father's occupation, would the relationship change? From our data we can suggest answers to these three questions.

To present the full data in tables might be confusing and would certainly be economically inexpedient. Therefore we have calculated correlations which seem to indicate the relationships. In table 4 are presented rank correlations between the percentage of fathers in an occupation and the percentage of boys choosing that occupation for the following groups: Actor, art, aviation, business executive, civil service (police, firemen, etc.), doctor, druggist, engineering, farmer, journalist, laborer, lawyer, minister, minor executive, musician, office worker, owner of small business, pro-athlete, salesman, scientist, skilled crafts.

TABLE 4

Rank correlations between fathers' occupations and sons' choices

GRADE	T			S			M			C		
	CHOICE			CHOICE			CHOICE			CHOICE		
	1	2	3	1	2	3	1	2	3	1	2	3
Freshman	.21	.30	.30	.08	.11	.08	.24	.12	.02	.15	.12	.31
Sophomore	.29	.31	.30	.34	.34	.45	.16	.30	.17	.31	.06	.37
Junior	.26	.45	.39	.23	.18	.25	.39	.30	.31	.03	.20	.04
Senior	.18	.18	.41	.32	.30	.34	.07	.15	.10	.21	.05	.11
Post-grad.	.42	.41	.51	.33	.29	.42	.16	.23	.13	....	....	....

In answer to the first question the table indicates that the school grade does not influence the relationship under consideration in any uniform manner. In no school, or for no choice, is there any clear tendency for the relationship to increase or decrease with advance in school. In all schools the postgraduate group gave higher correlations, but, as has been mentioned, these are highly selected groups, and the correlations may be spurious because of the small number of cases involved.

In the second and third columns under each school are given similar correlations for the second and third choices. Of the nineteen correlations based on third choices, fourteen are greater than those for the first choice, and only five are equal to or less than these. Furthermore, ten of them are greater than the second choice correlations, and eight are greater than both the first and second choice correlations. While, because many of the differences are very small, one can hardly generalize too broadly, yet the data are suggestive. Apparently father's occupation is more influential in determining the last of three choices than the first choice. Perhaps when confronted with the problem of making a choice the boy selects first that vocation which at the moment offers the greatest appeal due to some more or less recent experience. When required to give further choices many boys finally turn to their father's occupation.

In order to consider an answer to the third question asked above, it was necessary to treat the data in a somewhat different manner; namely, match each boy's choice against his own father's occupation. To do this a sample group of 1000 was drawn from the total number in approximately the same grade-school proportions. No further criteria of selection were used and the resulting sample when distributed by occupations of the fathers closely corresponded to the distribution of the total group.

The same occupational groupings listed above were used in studying the sample group with the exception of putting "actor" in the "art" group, and combining the groups "minor executive" and "owner of small business."

Approximate Barr scale ratings of each occupational group were calculated by averaging the Barr P. E. values of each of the occupations included under each heading. As the Barr scale does not include many of the occupations we encountered it was necessary for the writers to assign numerical values which in their judgment appeared to be most reasonable. The final ratings disregarding fractions were:

Journalism	15	Minor executive and owner	11
Scientist	15	Aviation	11
Engineering	15	Office work	11
Doctor	15	Salesman	10
Minister	14	Pro-athlete	10
Business executive	14	Civil service	10
Art	14	Skilled crafts	9
Musician	14	Farmer	8
Teacher	13	Laborer	6
Lawyer	13		

The percentages of choices higher than, the same as, and lower than father's occupation are shown in table 5. For all

TABLE 5

Distribution of choices at, above and below the fathers' occupational level

	T		S		M		C		TOTAL	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Higher	235	59.6	146	69.9	88	72.7	57	69.5	526	65.3
Same	96	24.4	26	12.4	16	13.2	16	19.5	154	19.1
Lower	63	16.0	37	17.7	17	14.1	9	11.0	126	15.6

N.B.—These percentages are based on the number of boys expressing a choice.

of the schools two-thirds of the boys had vocational choices in groups with a higher rating than that of their fathers, about 15 per cent selected occupations in lower groups, while 20 per cent selected occupations at the same level. In the various schools there were variations; *e.g.*, in School T only 60 per cent selected above and 24 per cent at the same level. In School S and M the percentage of boys selecting at the

same level were only 12 and 13 respectively, while School S had nearly 18 per cent selecting lower and School M had 73 per cent selecting higher. This may be a result of the occupational distribution of the fathers as has been shown in table 3.

In table 6 are shown, by occupational groups, the percentage of fathers whose sons choose occupations at the same

TABLE 6

Percentage of 'same' choices by occupations

OCCUPATION	NUMBERS	PERCENTAGES	
		Fathers	Sons
Journalist	2	100.0	8.7
Scientist	0	0.0	0.0
Engineer	8	38.0	21.0
Doctor	11	73.3	16.7
Minister	1	25.0	11.1
Business executive	6	15.0	50.0
Artist	0	0.0	0.0
Musician	0	0.0	0.0
Lawyer	2	20.0	4.2
Teacher	3	50.0	50.0
Minor executive and owner	25	15.7	48.0
Aviator	0	0.0	0.0
Office worker	3	5.9	9.1
Salesman	10	8.1	38.4
Pro-athlete	0	0.0	0.0
Civil service	3	7.2	25.0
Skilled craft	74	30.6	49.4
Farmer	2	28.6	10.5
Laborer	4	6.0	80.0

level, and in the second column the percentage of boys who choose an occupation at the same level as their fathers. There appears to be some tendency for sons of fathers in higher occupational classes to choose occupations at the fathers level more frequently than in the lower levels. The same tendency is apparent when one considers the sons. Here the per cent of boys who select at the same level as their fathers is lower at the higher end of the scale and tends to increase as the rating decreases.

These figures would mean that the sons of fathers in the higher occupations tend more frequently to be influenced by their fathers' occupation than boys whose fathers' occupation

lies lower in the scale. Also, as would be expected, it is evident that boys tend to choose occupations rather higher than those of their fathers. Which corroborates the testimony of the preceding table.

It is of further interest to note that in giving the reasons for their first choice the per cent giving "father's occupation" do not compare with the percentage actually choosing the same class as their fathers. In School T only 4.2 per cent gave this reason, while in School S 13.1 per cent gave it. This is the only school where the per cent for this reason and the per cent choosing the same, as shown in table 5 in any sense agree. For the other two schools the percentages are 8.0 for M and 7.2 for C.

SUMMARY

1. The boys in four large high schools were asked to give certain information relating to vocational choices, and 4543 questionnaires were returned. Of these about 90 per cent expressed at least one choice. The smaller high school had a greater percentage with choices than the larger ones, while the type of school, vocational or academic, apparently had no influence.

2. The data support the statement that a very small number of boys while in high school desire to follow their fathers' occupation. In fact the larger percentage choose an occupation at a higher level than that of their father.

3. That the choices as expressed cannot be followed in a large number of cases is suggested when a comparison is made with the census figures. Nearly 70 per cent of the boys want to engage in work that is represented by only 35 per cent of the present gainfully employed population. On the other hand only 1 per cent want to engage in laboring occupations which are represented by 30 per cent of the population and by 11 per cent of their own fathers. If the 10 per cent of boys giving no choice were all to engage in laboring the high school group would just about replace their fathers.

NOTE ON A TRANSFORMATION FUNCTION FOR PROPORTIONS AND PERCENTAGES

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THE standard error of a proportion[1], p', is given by the well known expression $\sigma_{p'} = \sqrt{\frac{p(1-p)}{N}}$, where p is the population value of the proportion, and N is the size of the sample. Since the value of p is not always known, p', the sample value, is often substituted for p as the best available approximation. If the deviation of the sample value of the proportion from its population value, $(p' - p)$, is considerable, the estimated value of the standard error of p' may be very inaccurate. When the critical ratio test for the reliability of a proportion is applied, $\frac{p'}{\sigma_{p'}}$ both the numerator and the denominator of this ratio will be inaccurate. If a function of p' could be discovered whose standard error is not dependent on p, the reliability of the critical ratio (when p' is substituted for p) would be greatly enhanced.[2]

An approximation to such a function is found in $t' = 2 \sin^{-1} \sqrt{p'}$. The standard error of t' is found to be $1/\sqrt{N}$ to a first approximation. Its standard error may be derived as follows:

[1] Since a percentage is equivalent to a proportion multiplied by 100, all the equations are equally valid for both proportions and percentages.

[2] A similar consideration has led R. A. Fisher to develop the z transformation for the correlation coefficient. The present note is the result of a suggestion made by Professor Harold Hotelling along this line, following the work of Fisher in "On the Dominance Ratio," *Proc. Royal Soc. Edinburgh, vol. 42 (1922), pp. 321–341* (amended in his "Distribution of Gene Ratio for Rare Mutations," *Proc. Royal Soc. Edinburgh, vol. 50 (1930), pp. 205–220*). The writer is thankful to Dr. E. E. Cureton and Dr. T. W. Forbes for reading the manuscript, and to Dr. Irving Lorge for calling the problem to his attention.

Let $\frac{t'}{2} = \sin^{-1}\sqrt{p'}$ and $\frac{t}{2} = \sin^{-1}\sqrt{p}$.

We wish to determine $E\ (t'-t)$ and $E\ (t'-t)^2$. [3]Now $p' = p + h$ where h is the deviation of the sample value for the proportion from the value in the population: $(h = p' - p)$.

By Taylor's Theorem,[4]

$$t' = 2f\ (p') = 2f\ (p+h) = 2\left\{f\ (p) + hf'\ (p) + \frac{h^2}{2!}f''\ (p) + \frac{h^3}{3!}f'''\ (p) + \cdots\right\}$$

$$\text{and } t' - t = 2\left\{hf'\ (p) + \frac{h^2}{2!}f''\ (p) + \frac{h^3}{3!}f'''\ (p) + \cdots\right\}$$

$$\text{now } f'\ (p) = \frac{d\, 2\sin^{-1}\sqrt{p}}{dp} = \frac{1}{\sqrt{p-p^2}}$$

$$f''\ (p) = -\frac{1-2p}{2(p-p^2)^{\frac{1}{2}}}$$

$$f'''\ (p) = \frac{3-8p+8p^2}{4\ (p-p^2)^{\frac{1}{2}}}$$

$$\text{and } t' - t = \frac{p'-p}{\sqrt{p-p^2}} - \frac{(p'-p)^2(1-2p)}{4(p-p^2)^{\frac{1}{2}}} + \frac{(p'-p)^3(3-8p+8p^2)}{3.8(p-p^2)^{\frac{1}{2}}} + \cdots$$

$$\text{and } E(t'-t) = \frac{E(p'-p)}{\sqrt{p-p^2}} - \frac{E(p'-p)^2(1-2p)}{4(p-p^2)^{\frac{1}{2}}} + \frac{E(p'-p)^3(3-8p+8p^2)}{3.8\ (p-p^2)^{\frac{1}{2}}} + \cdots$$

now [5]$E\ (p'-p) = 0$

$$E\ (p'-p)^2 = \frac{p\ (1-p)}{N} = \frac{(p-p^2)}{N}$$

[3] *E* signifies the expected value or the average of the values in all possible samples.

[4] This derivation was suggested by Professor Harold Hotelling.

[5] Tippett, L. H. C., "The Methods of Statistics," London. Williams & Norgate, Ltd. 1931. P. 32.

$$\mathrm{E}\,(p'-p)^3 = -\frac{(p-p^2)(1-2p)}{N^2}$$

$$\text{and } \mathrm{E}\,(t'-t) = -\frac{(p-p^2)(1-2p)}{4N(p-p^2)^{\frac{1}{2}}} + \frac{(p-p^2)(1-2p)(3-8p+8p^2)}{24N^2(p-p^2)^{\frac{1}{2}}} + \cdots$$

$$\text{and } \mathrm{E}\,(t'-t) = \frac{(1-2p)}{4N(p-p^2)^{\frac{1}{2}}}\left\{-1+\frac{3-8(p-p^2)}{6N(p-p^2)}+ \text{terms involving higher powers of } \frac{1}{N}\right\}$$

If N is sufficiently large (>30), then the terms involving $\frac{1}{N}$ to higher powers than the first can be neglected. There will still remain a bias in t' which equals $-\frac{1-2p}{4N(p-p^2)^{\frac{1}{2}}}$. That is to say, no matter how accurately the distribution is sampled, the average value of t' will be greater than the true value, t, by the above quantity. This quantity, however, is divided by N and becomes negligible when N is sufficiently large. It should also be noted that when $p > .50$, $\mathrm{E}\,(t'-t) > 0$, and when $p < .50$, $\mathrm{E}\,(t'-t) < 0$. For $p = .50$, $\mathrm{E}\,(t'-t) = 0$.

$$\text{Now } \mathrm{E}\,(t'-t)^2 = \frac{\mathrm{E}\,(p'-p)^2}{p-p^2} - \frac{\mathrm{E}\,(p'-p)^3(1-2p)}{2(p-p^2)^2} + \frac{\mathrm{E}\,(p'-p)^4(1-2p)^2}{64(p-p^2)^3} + \text{higher terms}$$

$$= \frac{1}{N} - \frac{(1-2p)^2}{4N^2(p-p^2)} + \text{higher terms in } \frac{1}{N}$$

$\mathrm{E}\,(t'-t)^2$ is the variance of t', and is equal to $1/N$ to a first approximation. For $p = .50$, there is no bias in t and the value of the standard error of t is exactly $\frac{1}{\sqrt{N}}$. Appar-

ently when p ≠ .50, the ordinary method is more exact. The discrepancy between the two methods decreases as N increases, (since it depends on $\frac{1}{N}$), and for large values of N should prove to be very small.

Theoretically, the t transformation has no advantages over the ordinary method, but practically it has considerable advantage. In comparing two proportions the value of the standard error must be computed for each proportion and substituted in the formula $\frac{p'_1 - p'_2}{\sqrt{\frac{p'_1 q'_1}{N_1} + \frac{p'_2 q'_2}{N_2}}}$. Utilizing the t method, the formula becomes $\frac{t'_1 - t'_2}{\sqrt{\frac{N_1 + N_2}{N_1 N_2}}}$, which is considerably simpler.[6] This advantage becomes especially important when a series of proportions on the same two samples are compared. In this case the standard error of the difference remains constant for all the comparisons since N_1 and N_2 remain constant. If the usual method is applied the standard error of each proportion must be computed separately.[7]

Application of T Method

Table 4 gives values of t for each value of p from .01 to .99. The most practical application of this table is found in such tasks as the item analysis of a test. In this situation the investigator desires to determine with greatest dispatch those items that differentiate between the criterion groups. The following example illustrates the advantage of the method.

[6] The tacit assumption is made that the sampling distribution of both p and t is normal. When N is large, p' has been shown to have approximately a normal sampling distribution. Whether t' also has a normal sampling distribution remains to be investigated.

[7] Tables have been provided by Edgerton (Jr. Applied Psychol. vol. 10, No. 3, Sept. 1926, pp. 378–391) to facilitate such computations.

Normal and abnormal individuals were utilized as the criterion groups for validating the items of a personality test. The percentages passing the various items in the two groups are shown in Table 1.

TABLE 1

Percentage of Successes by Items

	N	ITEMS 1	2	3	4
Normal	229	31.2	20.8	29.6	61.2
Abnormal	260	19.7	11.8	17.0	43.3
Difference		11.5	9.0	12.6	17.9
Standard Deviation		3.96	3.33	3.83	4.46
Critical Ratio		2.90	2.70	3.28	4.01

The usual procedure is to compute the standard error of the difference for each item by means of the equation $\sigma\,(p'_1 - p'_2) = \sqrt{\frac{p'_1 q'_1}{N_1} + \frac{p'_2 q'_2}{N_2}}$ and then to obtain the critical ratio

$$C_p = \frac{p'_1 - p'_2}{\sigma_d}$$

In utilizing the t method, the following procedure is adopted. Each percentage value is transformed into a t value by means of Table 4 in this article.

TABLE 2

T Values Corresponding to the P Values in Table 1

	N	ITEMS 1	2	3	4
Normal	229	1.1810	0.9521	1.1592	1.7924
Abnormal	260	0.9272	0.7074	0.8500	1.4301
Difference	.....	0.2538	0.2447	0.3092	0.3623
Standard Deviation	0.091	.....	.....	.....	.....
Critical Ratio	.....	2.79	2.69	3.40	3.98

Since the standard error is 0.091, any difference that exceeds .27 is statistically significant. It should be noted that the critical ratios obtained by the two methods are quite similar and the differences are not constant in direction.

In order to compare the t method with the p method empirically, 80 items on a personality test were analyzed by both methods.[8]

A group of 229 normal individuals were compared with a group of 260 abnormal individuals on these items. The critical ratios of the difference between the proportion of normal individuals and the proportion of abnormal individuals making the same response to each of the items was computed by both methods. Since there were 3 responses to each item, the total number of comparisons was 240. These critical ratios varied between ± 5.0. Table 3 gives the distribution

TABLE 3

Differences between Critical Ratios Computed by the Two Methods

DIFFERENCE	OBTAINED	EXPECTED	X^2
0.40: 0.44	1	0.4	12.03
0.35: 0.39	4	1.0	
0.30: 0.34	1	2.7	1.1
0.25: 0.29	2	6.2	2.8
0.20: 0.24	6	11.3	2.4
0.15: 0.19	10	18.7	4.0
0.10: 0.14	20	27.2	1.7
0.05: 0.09	36	34.6	0.1
0.00: 0.04	37	18.2	63.1
−0.05: −0.01	47	18.2	
−0.10: −0.06	25	33.7	2.2
−0.15: −0.11	23	27.2	0.6
−0.20: −0.16	12	19.4	2.8
−0.25: −0.21	10	11.3	0.1
−0.30: −0.26	4	6.0	0.7
−0.35: −0.31	1	2.6	0.9
−0.40: −0.36	1	1.2	0.3
	240	240.0	94.8

M −0.0002.

σ 0.1307.

[8] The data were supplied by Miss Sarah Ferrall from a study conducted at the New York State Psychiatric Institute.

of differences in critical ratios between the T and P methods. The mean difference is -0.0002 and the standard deviation of the differences is 0.1307. The highest difference was ± 0.40.

This distribution of differences was compared with the distribution of a normal curve of the same population, mean and standard deviation. Column 2 in Table 3 gives these expected values and column 3 gives the X^2 values corresponding to the discrepancies found between the obtained and theoretical values. The number of degrees of freedom is 14, and a X^2 of 94.8 can arise by chance from such distribution less than one time in 100. Apparently the distribution is not normal. The greatest discrepancy is at the center. There are many more zero differences than would be expected by chance. This is perhaps due to the values in the neighborhood of $p = .50$ which yield a zero difference actually.

Summary: An attempt was made to find a transformation value for proportions and percentages whose standard error will be free of the sample value of the proportion. An approximation to such a function was found in $\frac{t}{2} = \sin^{-1}\sqrt{p.}$ This function has a bias equal to $-\frac{(1-2p)}{4N(p-p^2)^{\frac{1}{4}}}$ to a first approximation and its standard error is $\frac{1}{\sqrt{N}}$ to a first approximation. Whenever the results obtained from this transformation value differ materially from those obtained by the usual method, the latter is to be preferred, since there is no bias in it. When N is large the two methods yield approximately equal results. The *t* method has a distinct advantage over the usual method in such tasks as item analysis. Tables for transmuting proportions and percentages into *t* values are provided.

TABLE 4

Table for Transmuting Proportions into T Values

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.00	0.0000	0.2004	0.2836	0.3484	0.4026	0.4510	0.4950	0.5356	0.5735	0.6093
.10	0.6435	0.6760	0.7074	0.7377	0.7671	0.7953	0.8232	0.8500	0.8762	0.9020
.20	0.9272	0.9521	0.9763	1.0004	1.0240	1.0472	1.0702	1.0929	1.1153	1.1372
.30	1.1592	1.1810	1.2025	1.2240	1.2450	1.2624	1.2871	1.3078	1.3282	1.3492
.40	1.3696	1.3896	1.4102	1.4301	1.4504	1.4705	1.4907	1.5109	1.5305	1.5509
.50	1.5708	1.5907	1.6111	1.6317	1.6509	1.6711	1.6912	1.7115	1.7314	1.7520
.60	1.7720	1.7924	1.8134	1.8338	1.8525	1.8792	1.8966	1.9176	1.9391	1.9606
.70	1.9824	2.0044	2.0263	2.0487	2.0704	2.0944	2.1176	2.1412	2.1653	2.1895
.80	2.2144	2.2396	2.2654	2.2916	2.3184	2.3463	2.3745	2.4039	2.4342	2.4656
.90	2.4981	2.5323	2.5681	2.6060	2.6466	2.6906	2.7390	2.7932	2.8580	2.9412

NEWS AND NOTES

Details of a proposed plan to aid at least 2,000,000 unemployed youth were recently made public by the United States Commission of Education and which may be put into operation as a part of the Works program. The plan calls for an adaptation of the present college student aid plan and the CCC Camp program for the purpose of assisting in their own communities the large number of unemployed youth unaided by other work relief projects. "The heart of the community set-up," according to Commissioner Studebaker, "would be a guidance and adjustment center. Young people desiring to participate in a combination work, education, recreation program would come to this guidance center. . . . He or she would be enrolled for such instruction as needed for personal advancement and improvement. . . . Each youth would receive only as much as needed up to a maximum of $20 per month while he participated in the guidance-work-education-recreation program."

The International Society of Experimental Phonetics will hold a meeting in London, beginning July 25, 1935. There will be a Joint Session with the II. International Congress of the Phonetic Sciences. This meeting will afford an opportunity to present experimental papers, demonstrate apparatus, discuss topics from all branches of phonetic science and to meet persons interested in the study of speech. Opportunities will be afforded to observe the methods of registering speech and of making sound films. Those interested may obtain further information by writing to the Secretarial Bureau Int. Soc. Exper. Phon., 73 Welbeck Street, London, W. I.

Emerson College, Boston, Massachusetts, will offer a new course in corrections of Speech Disorders in the summer session of 1935 under the direction of Samuel D. Robbins, Secretary of the American Speech Correction Association. The work will include class instruction in Speech Pathology, Mental Hygiene, Phonetics and Diction, and Clinical Practice in the Massachusetts General Hospital and other Speech Clinics. Detailed information may be secured by addressing The Registrar, Emerson College, 130 Beacon Street, Boston, Mass.

A final report on the financial situation in rural schools and independent school districts for the current school year, prepared under the direction of United States Commissioner of Education John W. Studebaker, reveals that more than one-eighth of the school children of the United States are in school districts without sufficient funds to operate

school the customary term. In 467 school districts in eight States there were no available funds to operate schools this year. In these districts there are 57,000 pupils and 1,745 teachers. The average monthly salaries paid to teachers in those districts where schools cannot operate more than a few months is less than $100 a month. In 16 States many teachers received less than $20 per month. In 22 States a considerable number of teachers received less than $40 per month. The chief causes of the financial emergency were found to be delinquent or unpaid taxes, decrease in taxable valuation resulting in lower returns from general property taxation, drought conditions, unusual or unexpected increase in population and maximum tax limitations too low.

On April 2, 1935, the Child Research Clinic met in a Spring Conference at The Woods Schools in Langhorne, Pa., for the purpose of hearing prominent men and women in the fields of education, arts and government discuss the problems of the exceptional child. A plea for greater attention to the needs of the 760,000 exceptional children needing scientific care and guidance was made. The consensus of the conference was that this country must awake to the seriousness of the problem and concentrate on a program to give such children a chance in life. The morning section was devoted to general educational problems and the afternooon section to special problems of the slow child, the problem child and the child with reading and speech difficulties.

According to a recent Federal Office of Education report courses of study in high schools throughout the United States are tending to prepare pupils more and more along useful lines, particularly occupational. An important section of the study deals with part-time cooperative training programs. Under this plan the pupil spends part-time in school and part-time on the job he pursues vocationally. About 165 schools offered training of this kind. The most common plan followed is that in which pupils spend alternate weeks in school and at work. Boys in college preparatory courses and in technical high schools were reported to rank highest in intelligence quotient. Academic and scientific groups in the general or comprehensive schools rank next. The social-economic level of the homes from which pupils in the different curriculum groups come is somewhat in agreement with the intellectual levels. Academic and scientific curriculums have larger proportions than other curriculums from the upper occupational levels, while household arts and industrial arts curriculums have larger proportions from the lower economic levels. About one-tenth of the pupils in the former curriculums in comprehensive high schools are sons and daughters of fathers who follow professional careers.

Dr. Alfred Adler, Viennese physician and founder of Individual Psychology, has been appointed as a member of the staff of the American Peoples College in Europe this summer. Dr. Adler will give a series of lectures in Individual Psychology for both laymen and professional people at the college headquarters at Oetz-in-Tirol, Austria. He will also conduct a field trip for a group especially interested in psychology for the observation of the practical application of his ideas and methods in Belgium, Holland, Switzerland, Austria, Italy, and France. In various cities the group will visit clinics, schools and hospitals and attend special lectures. In Vienna Dr. Adler's own home will be headquarters for the group. The entire course lasts nine weeks, beginning the first of July.

Those wishing to know further details of the project may write to the New York office of the American Peoples College in Europe, 545 Fifth Avenue.

BOOK REVIEWS

CLAUDE E. HEATON. *Modern Motherhood; A Book of Information on Complete Maternity Care; Prenatal—Delivery—After Care.* New York: Farrar and Rinehart. 1935. 271 p.

There has been a great number of books and booklets issued by commercial publishers, the Federal government, State governments and national associations designed as handbooks for prospective mothers. This book by Dr. Heaton would easily take a leading position among all this literature. In a free, simple and yet accurate way he has discussed the problems of pregnancy, childbirth, human embryology and maternity care. In many respects it is the most practical of the many maternity handbooks.

Of some interest to psychologists is his chapter on mental hygiene in maternity which considers various aspects of the mother's attitude toward the coming baby. He also has the unusual chapter on "The Expectant Father" in which is considered the father's obligations, including his psychological function.

LIONEL S. PENROSE. *Mental Defect.* New York: Farrar & Rinehart. 1934. xi, 205 p.

It is an interesting circumstance that most of the textbook treatments of mental deficiency in this country have been from psychologists, while in England the medical men appear to have been more active. This difference in the professional interests of authors has resulted in a practically complete lack of works giving a well balanced account of mental deficiency from all the important angles—medical, psychological, social and educational. Some day such a treatise must be written.

Dr. Penrose says that his book "is intended for the use of medical or lay persons who desire to obtain information on some of the scientific problems associated with the study of mental deficiency." He frankly admits that he has treated at greatest length those aspects of the subject in which he is personally most interested. Within such limits he has done a creditable job. As his interests are largely medical we find this approach to the problem discussed most completely.

Six chapters are devoted to methods of study. Of these, three are devoted to medical, anthropometric, and laboratory examinations, one to psychological (in which intelligence testing is inadequately treated in two and a half pages), and two to personal and family history with emphasis on the study of hereditary factors. A chapter on classification of mental defect is followed by five chapters devoted to pathological types and amentia associated with the mental disorders. This enumeration of the contents of over half of the chapters emphasizes the medical bias.

For non-pathological feeblemindedness the author uses the term "subcultural amentia." His discussion of this group is eminently sane. As the evidence for causation in this group is not at all clear the author warns that we must not be too ready to discover hereditary etiological factors.

There are two chapters devoted to treatment. The first of these is concerned with a sort of philosophy of treatment in general and with English practice in particular. The second, entitled "Treatment in the United States," gives the impression of having been written by an American and added to the book by the American publishers. However, there is no direct indication that there is a difference in authorship. This chapter describes in a rather superficial way special classes, institutional care and training, and colonization and parole.

A general characterization of the work would note that the medical and biological aspects are well, if briefly, treated, but that the psychological and social problems are all but neglected entirely.

GEORGE D. STODDARD AND BETH L. WELLMAN. *Child Psychology*. New York: Macmillan. 1934. xii, 419 pp.

JOHN J. B. MORGAN. *Child Psychology*. New York: Farrar & Rinehart. Rev. ed. 1934. xii, 502 pp.

The only point of similarity between these two books is the title. In organization, content and point-of-view they are as different as two books with the same title could well be.

To most readers of this review, Morgan's book is familiar in its first edition. The new edition has been enlarged somewhat by the discussion of recent literature. But in this respect it suffers when the 280 footnotes, many of which are not references, are compared to the 493 references given in Stoddard and Wellman's bibliography. While I have not attempted to check the references there is one so absurd that it cannot be ignored. On page 141 the author mentions the Porteus Maze as a test of "hand coördination" (which it is anything but) and refers to a paper published in 1915; this in spite of the fact that there have been two revisions of this test since that time! In spite of such evidence of carelessness this revision is as useful as its predecessor as an elementary presentation from a child-training point of view that would be useful for parents, social workers, or others concerned with the care and training of children.

Consideration of Stoddard and Wellman's new volume presents an entirely different picture of child psychology. Here is an attempt, which ranks high among all of the recent attempts, to integrate the literature of this vast, bewildering field. Stylistically, the book is tiring because in many parts whole pages are essentially a series of abstracts. Yet there appears to have been a nice selection of material to be included, and no section or chapter is left without an integrating discussion. The

work is divided into four major divisions. (1) trends and methods, (2) motor and mental development, (3) social behavior, play and artistic ability, and (4) personality and adjustment. In each of these are presented the most significant findings, succinctly summarized, carefully related to relevant studies, and judiciously interpreted in terms of the ontogeny of behavior. This is an excellent text for professional, technical courses in child psychology.

So you pays yo' money and you takes yo' choice. Morgan for the art of child training, Stoddard and Wellman for the science of child psychology.

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Indiana University.

CARL RENZ, M. D., AND MILDRED P. RENZ. *Big Problems on Little Shoulders.* The Macmillan Company, New York, 1934, 129 pp.

Several cases of behavior problems in children are presented with an explanation. Inferiority feelings and conditioned fears due to nagging and inappropriate punishment are given as the chief causal factors in behavior problems. Suggestions are made as to how to punish the child appropriately, "to make the punishment fit the crime" in such a way as to avoid feelings of injustice or resentment. Rather specific situations which commonly give rise to misbehavior are dealt with, such as the case of the awkward child, the ugly duckling type, and the problems arising when a new brother or sister arrives.

The latter part of the book deals mainly with the problems of sex; the attitude of the parents toward sex, masturbation, sex experiences of childhood.

The book is written in a simple and interesting style, and is evidently meant for the ordinary parent. While limited in its scope (it might be condensed into the equivalent of about one chapter in a child psychology text) it could be read with profit by most, perhaps all, parents.

AMOS C. ANDERSON,
Ohio University.

FLUGEL, J. C. *A Hundred Years of Psychology.* New York: Macmillan, 1933, pp. 384. $3.75.

The author has given not only a factual account but also an interpretation of the development of psychology for the past one hundred years. As a matter of fact his account covers more than one hundred years for it takes cognizance of events leading up to 1833, the beginning of the century period, by summarizing the position of psychology at this time.

Starting with the systematic psychology of James Mill, Thomas Brown, Friedrich Beneke, and others we see psychology in the embryonic stage, a science so small and insignificant that it was scarcely recognized by its parents, Philosophy and Medicine. In the period 1833–1860 the most significant development is Weber's Law by which a "relentless attack

upon the mysterious problems of the human mind'' (p. 99) is initiated. Scientific interest in hypnotism is revived by Elliotson and for a time it is used successfully to produce anaesthesia during surgery. Due to hostility of the medical profession and the discovery of chemical anaesthetics, hypnotism again falls into the hands of charlatans and ''psychological science suffered heavily in consequence'' (p. 108).

From 1860 to 1900 we find psychology emerging from the infancy stage to that of the rapidly growing youth. The influence of evolution is evidenced in the works of Spaulding, Fabre, Romanes, Morgan and Jennings. By 1900 experimental psychology is employing animals in its researches to understand human learning and other behavior. Culminating the works of Fechner and Helmholtz, Wundt establishes the first independent psychological laboratory devoted only to investigating psychological phenomena and thus definitely attempts to make psychology a science. Child, social, abnormal and physiological psychology have their beginnings and we see the youthful science becoming interested in ''the general study of life in all its varied manifestations, both animal and human'' (p. 120).

In the last period, from 1900 to 1933, psychology is approaching adolescence although in many respects ''it is still infantile, still relatively uncoordinated'' (p. 358). In this period, the work started in former periods is followed up while new developments are mainly in the form of ''schools'' (Gestalt, Behaviorism, Hormic Psychology, Psychoanalysis, Factor School, and Type Psychology), the development of mental tests, and some applications in industry, sociology, and education. One of the distinctive features of the present volume compared to other recent histories is the clear presentation of British psychology, especially of Spearman and the ''factor school.'' Freudian theory and its applications to sociology and anthropology are given in some detail and form a very sympathetic point of view since the author is one of the leading exponents of this ''school.'' With respect to Adler's Individual Psychology, Dr. Flugel gives an interesting illustration of direct compensation applied to psychologists when he says, ''This may be done directly . . . as when a person gifted with exceptionally little insight into the thoughts and motives of his fellows compensates by becoming a psychologist'' (p. 295).

Dr. Flugel has given us one of the most readable, complete, short histories available. His interpretation of past growth and development is reasonable while his prediction for the future is challenging. It is a book that will be appreciated by students as well as by professional psychologists. It is recommended to all who desire to understand more about what psychology has done and is trying to do.

An interesting chronological table recording important publications or events for almost every year from 1807 to 1933 is given.

RALEIGH M. DRAKE,
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HOLLINGWORTH, H. L. *The Psychology of the Audience.* New York: American Book Company. 1935. Pp. x + 232.

The book is an attempt to gather up the scattered bits of experimental evidence which have some bearing on problems of the audience and to supplement them with some generalizations that are plausible on the basis of fundamental psychological theory. The discussion includes both the problems of influencing the audience and the effect of the audience on the speaker. The general outline of the book follows a rather interesting analogy with the psychology of advertising. It is necessary to catch the attention of the audience, hold its attention, impress its memory, influence it by persuasion and finally direct its action. Prior to the discussion of these points, however, there is an analysis of the different types of audience, namely, the pedestrian, the discussion group or passive audience, the selected audience, the concerted audience, and the organized audience. The five functions just mentioned are carried through these five types of audience, showing how in the pedestrian audience it is necessary to employ all five functions, while in the passive audience we begin with problems of holding attention or interest, with the selected audience we begin with problems of impressing the memory, and so forth. The author opposes the Gestalt notion of the audience, attributing it to mysticism.

Then we come to a discussion of the five functions above mentioned. In subdividing these topics the advertising analogy is carried still further in some cases. For instance, in catching the audience's attention we have mechanical and interest incentives. The author makes some rather sensible suggestions, for example: if the audience is being distracted by something it is advisable to attempt to get back their attention by employing some other sensory mode, that is, an unoccupied channel. In holding the audience's attention we have again the mechanical and interest devices. Attention span is mentioned in connection with the distraction by too many other persons on the platform or by sentences that are too long. An experiment shows that results were less satisfactory when reading from a manuscript. The chapter on impressing the audience's memory is the most replete with experimental material. Those studies dealing with the comparative effect of visual and auditory presentation are somewhat equivocal but readers interested in this particular problem in other connections will find a fair collection of references in this chapter. A few of the experiments hit the public speaking problem directly but in some cases the analogy is a little strained. For instance, the presentation of advertisements in the climax or anti-climax order with reference to size is suggested as throwing possible light on the use of climaxes in an address.

When it comes to persuading the audience we have further advertising analogies in the short and long circuit methods of appeal and in the fre-

quent tendency toward rationalization. The relation between belief and desire which has been demonstrated experimentally would tend to imply the advisability of making one's proposition desirable. Some of the fallacies of formal logic are cited in this connection, and when we talk about the audience made up of the average man the author gives a little inventory of the average man with reference to his size, vocabulary, education, memory span, intelligence quotient, occupation, etc. The last function deals with producing action and we have some mention of suggestion, the effect of slogans and the finding that majority opinion has a more pronounced effect than expert opinion. The discussion then turns to the auditorium and seats which should be rather close for an audience that is to take an intellectual attitude. Lighting, ventilation, the platform and the general architecture are likewise considered.

The remainder of the discussion deals with the effect of the audience on the speaker and his necessity of adjusting to it as a unit or as individuals or perhaps a compromise between the two alternatives which is most effective of all. A few experimental studies of the effect of the audience on the speaker are cited, although most of the experiments in this connection did not hit the public speaking problem directly. It develops that perhaps the attitude of the audience is more important than their mere presence. The final chapter discusses stage fright which may be a direct fear phenomenon or an emotional neurosis or sometimes simple emotional redintegration.

The book is interesting, well-written and has a lot of helpful suggestions for those who are concerned with the subject under consideration. The reviewer's only adverse criticism is a tendency to be a little too categorical in some of the summary statements which are based on comparatively few and sometimes contradictory experiments. These experiments are not always evaluated critically. For instance we read that "the audience is more moved by what it hears and more permanently impressed by what it sees." A thing which interested the reviewer very much was the large number of analogies which the author finds between public-speaking problems and advertising problems. He felt repaid for reading the book on the basis of this one idea alone. It is especially impressive to one familiar with Hollingworth's early work on Advertising and Selling. Each chapter has a concise summary in the form of numbered paragraphs. The book is an interesting attempt to explore a field which has not hitherto been systematically attempted by the psychologist. It should prove stimulating to one looking for experimental problems in this field.

BENTLEY, JEROME H. *The Adjustment Service.* New York: American Association for Adult Education. 1935. Pp. x + 67.

This is a report of an experiment in adult guidance in New York City extending over sixteen months and designed to demonstrate the value

of a personal counselling service. It was supported by private funds and relief funds. The technical personnel were loaned by other organizations and supplemented by numerous relief workers. Some sixteen thousand clients availed themselves of the service and at least four-fifths of these received some help. A battery of tests similar to those used in the Minnesota Unemployment Project was given along with medical and psychiatric examinations where indicated. Publicity was given in the papers and when clients appeared they were given a leaflet explaining what the service was and was not. For instance, it was not "an employment agency, a relief agency, a fortune-telling agency." It would help an individual "to review his occupational experience thoughtfully, to examine his education and training critically, to find opportunities to add new skills that are necessary in his work." A blank with test scores in graphic form and other information regarding the individual is used.

Some typical cases are described, showing the type of service rendered, which included avocational suggestions and suggestions regarding training. It also tied in with the emergency education program. A number of experts in the field came in and visited the service and gave their opinion, to the effect that the organization and method of counselling were satisfactory but it was weak on the follow-up aspect and really should undertake something in the way of help in placement. The total cost of the experiment was about a quarter of a million dollars which figured the cost per client somewhere in the range of that for various other agencies of this general type.

The monograph looks toward the future and makes suggestions regarding the relation of this kind of project to other projects. For instance, it is suggested that the guidance programs in the school sometimes fall short on the personal counselling phase and merely give a course on occupations as part of their regular curriculum. However, there is a need for the type of thing done in this particular service. While it might be desirable for the various community agencies to have a counselling service attached to them, the writer feels that for the present it would be well for the community to have a centralized agency of this sort which would work in with education, employment, social case work and other services. He does very wisely emphasize the inadvisability of undertaking such a project unless competent administrative and technical leadership is available.

It is impossible to review the work critically without seeing it at first hand. The most that can be said regarding the report is that it is straightforward and objective and makes no effort to sell the idea or to obscure any undesirable features. The writer realizes as well as the reviewer the impossibility of actual monetary evaluation of the service to the clients which can be compared with the actual cost. We probably never can evaluate these intangibles. Obviously the project was expen-

sive but in these days of social experimentation, we are accustomed to expensive experiments in this field. In reading the social case studies one is impressed by the obvious place that this type of thing fills in the lives of some individuals. It would seem to the reviewer that perhaps by conducting follow-up studies of persons who have gone to such a service we can then determine methods for selecting those who would profit most by the service. If perhaps half of those who went through were not in a position to profit very much from the service, the expense could have been cut down that much and effort devoted to those who would very definitely derive some benefit from it. It might be possible to devise some rather expeditious procedure for sorting out those who needed individual counselling and those who did not. The problem might be analogous to giving a group intelligence test in the schoolroom to find those special cases which needed a Binet. The present project certainly was a noble experiment and it is hoped that it may be possible to make a follow-up study of some of the clients with a view to evaluating the service and possibly getting at some of the things just mentioned.

VITELES, MORRIS S. *The Science of Work.* New York: W. W. Norton and Company. 1934. Pp. xi + 442.

The book is a popularized and simplified edition of the author's earlier work on "Industrial Psychology" (Norton, 1932). From the standpoint of erudition and scientific contribution to the field there is no comparison between the two. However, the present work is a very good presentation of the subject for the non-technical reader, whereas the former was entirely over his head. It avoids most of the technical terminology, minimizes tabular material, resorts considerably to graphic presentation and includes the references at the end of the book rather than in numerous footnotes. The point of view also reflects the industrial psychologist's philosophy of the present time a little more than did the previous work. For instance, we find the suggestion to analyze aptitudes so that a worker may be trained in related jobs and transferred when his job is replaced by a machine. Attention is called to the problems involved in adjusting 10,000,000 white collar workers to manual jobs in the near future.

The first two chapters are historical, tracing work from prehistoric times down to present-day industrial psychology. This introductory material does not contribute much to the discussion although it is interesting. We find the usual chapter on the gold bricks and then a first-rate elementary discussion of the employment problem. A graphic job analysis and a graphic presentation of the worker's capabilities are included. The experimental approach is illustrated in some detail with substation operators and more briefly with some other well-selected cases. A discussion of accidents includes the possibility of detecting accident proneness by tests and also the value of studying the individual case in

an accident clinic. The treatment of teaching the worker the job is conventional. In connection with fatigue we have consideration of rest pauses, illumination and the like. Individual differences and susceptibility to monotony are noted and some of the usual remedies for monotony suggested. Motives and incentives are analyzed and the suggestion made that we experiment with them just as we do with accident susceptibility. A chapter which is not found in all books of this type deals with salvaging the misfit by making clinical studies in individual cases, such as personality defects. The book concludes, rather appropriately, with stress upon the importance of supervision and foremanship.

The author's philosophy is most commendable and he takes a rather broad social attitude. He repeatedly stresses the fact that industrial psychology is concerned with the happiness of the worker as well as his efficiency and extends its consideration beyond the mere hours that the employee spends in the plant and thinks of him as an individual in his total environment. It is especially fortunate that this point of view is stressed in a book which is read primarily by the layman and it should create a rather favorable impression toward the industrial psychologist. The book attempts to cover a large amount of ground and obviously must touch rather lightly on many points. On the whole, however, the selections are well made and the illustrative material is to the point. It includes quite a number of forms or blanks for various industrial purposes which make it seem more concrete to the business reader and occasionally may offer useful suggestions to the technically trained individual. The book is obviously written down to the level of the layman but nevertheless remains systematic. It is enlivened by simple but expressive line drawings in somewhat cartoon style and even some of the charts have thumb-nail sketches of this sort. The slightly humorous flavor of the illustrations does not penetrate to the text itself which the reviewer regrets slightly although some readers may be glad. The book is well done and obtains its objective. Technical psychologists will prefer Viteles' earlier more profound work. The non-technical reader, however, will find the present book a very good introduction to the field of industrial psychology. The ideal college text on this subject probably falls about half-way between the two books.

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DALE, EDGAR. *The Content of Motion Pictures.* New York: Macmillan Co. 1935. Pp. xv, 234.

DALE, EDGAR. *Children's Attendance at Motion Pictures.* New York: Macmillan Co. 1935. Pp. ix, 81.

In April, 1934, a review of ten of the Payne Foundation Studies on Motion Pictures and Youth was published in this journal under the title

Motion Pictures and Youth: A Review. This review pointed out the variety and importance of the findings which demonstrated that the influences of motion pictures on children must be interpreted in the light of a particular child's history. There are still further questions which must be answered if one is to attempt evaluation of the total problem. These questions ask what things are exhibited in ordinary commercial pictures and how wide-spread is the exposure of children to these commercial pictures.

The two studies under review (which are, incidentally, bound in one volume) attempt to furnish answers to these questions. The author subjected a large number of pictures—1500 in all—to varying degrees of analysis in an attempt to find something about the types of theme, locale, characters and the behavior of these characters to be found in commercial films. In general his data suggest that commercial producers tend to emphasize pictures of urban, upper economic classes with perhaps too much attention devoted to problems of shady sexual relations and other types of anti-social behavior. There seems to be a decided lack of interest in such problems as industrial relations, agricultural and the like which actually make up the primary interests of most of our population. On the whole, the pictures were directed toward the young adult and would seem to offer nothing to the child. Thus, in answer to the first question proposed above it must be said that the present commercial pictures do not offer the type of entertainment that is most desirable or enjoyable for children. Dr. Dale suggests that it would not be impossible to produce pictures that would be definitely appealing to children and at the same time would be enjoyed by adults.

In an attempt to secure some information regarding our second question, an analysis was made of the daily attendance at a selected group of Columbus, Ohio, theatres. This analysis indicates that probably not less than some 37 per cent of movie audiences are under 21 years of age and 14 per cent are under 13 years of age. There are presented reasons why this estimate may be too low for the country at large. Such data indicate that whatever the influences of movie pictures on individual children may be the problem is a large one merely in terms of possible influences. Also, they suggest that it would be a reasonable economic move for the producers to release pictures having a definite appeal to children.

Studies in Infant Behavior: I. By Orvis C. Irwin, LaBerta A. Weiss and Esther M. Stubbs. University of Iowa Studies No. 281, Studies in Child Welfare, Vol. IX, No. 4. 1934. Pp. 175. $1.35.

This monograph is the first in a new series from the University of Iowa Child Welfare Research Station. There are five separate papers: (1) Weiss, "Differential variation in the amount of activity of newborn infants under continuous light and sound stimulation," (2) Stubbs,

"The effect of the factors of duration, intensity, and pitch of sound stimuli on the responses of newborn infants," (3) Irwin and Weiss, "Differential variations in the activity and crying of the newborn infant under different intensities of light," (4) Irwin and Weiss, "Effect of clothing on the general and vocal activity of the newborn infant," (5) Irwin and Weiss, "Effect of darkness on the activity of newborn infants."

These papers present a new methodological approach to the study of neo-natal behavior. The data are based largely on polygraph records secured by general body movement rather than being limited to specific acts. These experimenters have used the method to study the effects of light, sound and clothing on activity with very interesting results. The methods offer great possibility for studying behavior at this very early age.

It is unfortunate that Dr. Irwin did not write a concluding chapter integrating the findings of these various experiments. We can suggest only the more outstanding conclusions. Activity decreased with increase in light and sound within the limits used (light, max. 3.9 f.c.; sound, max. 75 deb). Unexpectedly maximum activity was not secured in complete darkness but in a dim light (about .002 f.c.). Loose clothing decreased the infants' activity. In general the findings indicated that moderate external stimulation, tactual, visceral and auditory, tended to decrease rather than increase activity in the newborn infant.

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NEW BOOKS AND PAMPHLETS RECEIVED

Books and pamphlets for review should be sent to JAMES P. PORTER, Editor, JOURNAL OF APPLIED PSYCHOLOGY, Ohio University, Athens, Ohio.

Allgemeine Psychologie auf Personalistischer Grundlage. WILLIAM STERN. Martinus Nijhoff, Publishers. The Hague. Price Gld. 7.20. 364 pp.

The Carnegie Foundation for the Advancement of Teaching. Twenty-ninth Annual Report, 1934. 522 Fifth Avenue, New York, 1934. 167 pp.

The Content of Motion Pictures and Children's Attendance at Motion Pictures. EDGAR DALE. Macmillan Company, New York, 1935. $2.50. 81 pp.

Examens et Concours. H. LANGIER, HENRI PIERON, MME. HENRI PIERON, DR. E. TOULOUSE, MLLE. D. WEINBERG. Conservatoire National des Arts et Metiers, 292 Rue Saint-Martin, Paris. 89 pp.

Factor Analysis in the Study of Personality. JOHN CLEMANS FLANAGAN. Stanford University Press, Stanford University, Calif. $1.25. 103 pp.

Human Personality and the Environment. CHARLES MACFIE CAMPBELL. Macmillan Company, New York, 1934. 252 pp.

Memoria, Universidad de Barcelona Seminario de Pedagogia, 1933–34. JORGE UDINA MARTORELL, Secretario, Barcelona, Spain, 1934. 43 pp.

The Modern Goliath: A Study of Talking Pictures. MILTON ANDERSON. David Press, 1329 S. Alvarado Street, Los Angeles, Calif. $1.50. 91 pp.

Modern Motherhood. CLAUDE EDWIN HEATON. Farrar & Rinehart, New York, 1935. $2.00. 271 pp.

Psychological Racketeers. DOROTHY HAZELTINE YATES. Bruce Humphries, Boston, 1932. $2.00. 232 pp.

The Psychology of Human Behavior. JOSEPH H. GRIFFITHS. Farrar & Rinehart, New York, 1935. 515 pp.

Psychology of Learning. ROBERT A. DAVIS. McGraw-Hill Book Company, New York, 1935. $3.00. 489 pp.

The Psychology of Learning. E. R. GUTHRIE. Harper & Brothers, New York, 1935. $1.50. 258 pp.

Tohoku Psychologica Folia. T. CHIBA. Tohoku Imperialis Universitas, Sendai, Japan, 1934. 129 pp.

Universidad de La Habana, Departamento de Intercambio, Universitario la Habana, Cuba. Director: JOSE A. PRESNO BASTIONY, La Habana, Cuba. 179 pp.

A Vocational Guidance Research in Fife. F. M. EARLE and J. KELGOUR. Report No. 6, National Institute of Industrial Psychology. Aldwych House, Wc. 2, London, England. Price 4s. 6d. 101 pp.

Wish-Hunting in the Unconscious. MILTON HARRINGTON. Macmillan Company, New York, 1934. $2.50. 189 pp.

Directory of American Psychological Periodicals

(Continued)

Comparative Psychology Monographs—Baltimore: Johns Hopkins University Press. Subscription $5. 400 pages per volume. Knight Dunlap, Managing Editor. Published without fixed dates, each number a single research. Founded 1922.

Genetic Psychology Monographs—Worcester, Mass.: Clark University Press. Subscription $7.00 per volume. One volume per year. Edited by Carl Murchison. Bi-monthly. Each number one complete research. Child behavior, animal behavior and comparative psychology. Founded 1925.

Psychological Abstracts—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $6.00. 700 pages ann. Edited by W. S. Hunter and R. R. Willoughby. Monthly. Abstracts of psychological literature. Founded 1927.

Pedagogical Seminary and Journal of Genetic Psychology—Worcester, Mass.: Clark University Press. Subscription $14.00 per annum; $7.00 per volume. 1,000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Child behavior, animal behavior, and comparative psychology. Founded 1891.

Journal of Social Psychology—Worcester, Mass.: Clark University Press. Subscription $7.00. 500-600 pages annually. Edited by John Dewey and Carl Murchison. Quarterly. Political, racial, and differential psychology. Founded 1929.

Personnel Journal—Baltimore: The Williams & Wilkins Co. Subscription $5.00. 500 pages, approximately. Edited by Walter V. Bingham. Bi-Mouthly.

Mental Measurement Monographs—Baltimore: The Williams & Wilkins Company. Subscription $5. 400 pages annually. Edited by Knight Dunlap and Buford Johnson. Published without fixed dates, each number a single research. Founded 1925.

Studies in Psychology and Psychiatry—Baltimore: The Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Edward A. Pace. Published without fixed dates, each number a single research. Founded 1926.

Journal of Educational Psychology—Baltimore, Md.: Warwick & York. Subscription $6.00. Edited by Jack W. Dunlap, Harold E. Jones, and Percival M. Symonds. Published monthly except June to August. Founded 1910.

Child Development—Baltimore, Md.: Williams & Wilkins Company. Subscription $5.00. 400 pages annually. Edited by Buford Johnson. Quarterly. Founded 1930.

Character and Personality—Durham, N. C.: Duke University Press. Subscription $2.00 per annum. Quarterly. Edited by Robert Sandek (London) and Ernest Seeman (Durham, N. C.). Founded 1932.

The Psychological Exchange—11 East 125th Street, New York, N. Y. Subscription $3.00 per annum. Bi-monthly. Edited by James Hargan. Founded 1932.

Directory of American Psychological Periodicals

American Journal of Psychology—Ithaca, N. Y.: Cornell University. Subscription $3.50. 624 pages annually. Edited by M. F. Washburn, K. M. Dallenbach, M. Bentley, E. G. Boring. Quarterly. General and experimental psychology. Founded 1887.

Journal of General Psychology—Worcester, Mass.: Clark University Press. Subscription $14.00 per annum; $7.00 per volume. 1,000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Experimental, theoretical, clinical, and historical psychology. Founded 1927.

Psychological Review—Princeton, N. J.: Psychological Review Company. Subscription $5.50. 540 pages annually. Bi-monthly. General Psychology. Edited by Herbert S. Langfeld. Founded 1894.

Psychological Monograph—Princeton, N. J.: Psychological Review Company. Subscription $6.00 per vol. 550 pp. Ed. by Joseph Peterson. Published without fixed dates, each issue one or more researches. Founded 1895.

Psychological Index—Princeton, N. J.: Psychological Review Company. Subscription $4.00. 300-400 pp. Edited by W. S. Hunter and R. R. Willoughby. An annual bibliography of psychological literature. Founded 1895.

Psychological Bulletin—Princeton, N. J.: Psychological Review Company. Subscription $6.00. 720 pages annually. Psychological literature. Monthly (10 numbers). Edited by John A. McGeoch. Founded 1904.

Archives of Psychology—New York: Columbia University. Subscription $6. 500 pp. ann. Ed. by R. S. Woodworth. Published without fixed dates, each number a single experimental study. Founded 1906.

Journal of Abnormal and Social Psychology—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $6. Foreign, $5.25. Editor, Henry T. Moore. Quarterly. 445 pages annually. Abnormal and Social. Founded 1906.

Psychological Clinic—Philadelphia: Psychological Clinic Press. Subscription $3.00. 288 pages. Ed. by Lightner Witmer. Without fixed dates. (Quarterly). Orthogenics, psychology, hygiene. Founded 1907.

Psychoanalytic Review—Washington, D. C.: 3617 10th St., N. W. Subscription $6. 500 pages annually. Psychoanalysis. Quarterly. Ed. by W. A. White and S. E. Jelliffe. Founded 1913.

Journal of Experimental Psychology—Princeton, N. J. Psychological Review Company. 500 pages annually. Experimental. Subscription $7.00. Bi-monthly. Edited by S. W. Fernberger. Founded 1916.

Journal of Applied Psychology—Lancaster, Pa.: Science Press Printing Co. Subscription $6.00. 600 pages annually. Bi-monthly. Edited by James P. Porter, Ohio University, Athens, Ohio. Founded 1917.

Journal of Comparative Psychology—Baltimore: The Williams & Wilkins Co. Subscription $5.00 per volume of 450 pages. Two volumes every year. Edited by Knight Dunlap and Robert M. Yerkes. Founded 1921.

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